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 Country \_\_\_\_\_

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Translation

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Search Results - Record(s) 1 through 2 of 2 returned.

 1. Document ID: JP 03231975 A

L10: Entry 1 of 2

File: JPAB

Oct 15, 1991

PUB-NO: JP403231975A  
DOCUMENT-IDENTIFIER: JP 03231975 A  
TITLE: INK JET RECORDING METHOD

PUBN-DATE: October 15, 1991

## INVENTOR-INFORMATION:

NAME	COUNTRY
TANAKA, MITSUGI	
MIKOSHIBA, TAKASHI	

## ASSIGNEE-INFORMATION:

NAME	COUNTRY
FUJI PHOTO FILM CO LTD	

APPL-NO: JP02026406

APPL-DATE: February 6, 1990

US-CL-CURRENT: 347/100; 427/256INT-CL (IPC): C09D 11/00; B41M 5/00; C09D 11/02

## ABSTRACT:

PURPOSE: To obtain fuchsine-contg. printed images with favorable hue by spraying in the form of droplets a recording liquid containing a specific coloring matter.

CONSTITUTION: Printed images are recorded on an image-receiving material by spraying in the form of droplets a recording liquid containing a coloring matter of formula I [R1 and R2 are each H, halogen, alkyl, cycloalkyl, aryl, carbamoyl, sulfonyl, acyl, etc.; R3 and R4 are each H, alkyl, cycloalkyl, aryl, etc.; n is 0-3; X, Y and Z are each of formula II (R5 is H, alkyl, cycloalkyl, aryl, heterocycle, amino, etc.) or N] (e.g. a compound of formula III).

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<a href="#">Full</a>	<a href="#">Title</a>	<a href="#">Citation</a>	<a href="#">Front</a>	<a href="#">Review</a>	<a href="#">Classification</a>	<a href="#">Date</a>	<a href="#">Reference</a>	<a href="#">Sequences</a>	<a href="#">Attachments</a>
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 2. Document ID: JP 03231975 A

L10: Entry 2 of 2

File: DWPI

Oct 15, 1991

DERWENT-ACC-NO: 1991-344768

DERWENT-WEEK: 199147

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TITLE: Ink jet recording method giving images of good hue - using ink contg.

pyrazole-contg. magenta dye

PATENT-ASSIGNEE:

ASSIGNEE	CODE
FUJI PHOTO FILM CO LTD	FUJF

PRIORITY-DATA: 1990JP-0026406 (February 6, 1990)

PATENT-FAMILY:

PUB-NO	PUB-DATE	LANGUAGE	PAGES	MAIN-IPC
<u>JP 03231975 A</u>	October 15, 1991		000	

APPLICATION-DATA:

PUB-NO	APPL-DATE	APPL-NO	DESCRIPTOR
JP03231975A	February 6, 1990	1990JP-0026406	

INT-CL (IPC): B41M 5/00; C09D 11/00

ABSTRACTED-PUB-NO: JP03231975A

BASIC-ABSTRACT:

In an ink jet recording method where ink is spayed on an image-forming material in droplets to record images on it, the improvement which comprises that the ink contains a dye(s) of formula (I), where each R1-2=H, halogen, alkyl, cyaloalkyl, alkoxy, aryl, aryloxy, aralkyl, cyano, acylamino, sulphonylamino, ureide, alkylthio, arylthio, alkoxycarbon yl, carbamoyl, sulphamoyl, sulphonyl, acyl or amino, each R3-4=H, alkyl, cycloalkyl, aralkyl or aryl, each R3 and 4, R2 and 3 and 4 can bond with each other to form a ring, =an integer of 0-3, each X, Y and Z=(a) or N, R5=H, alkyl, cycloalkyl, aralkyl, aryl, a heterocyclic ring, alkoxy, aryloxy or amino and, when X=Y=(a) or Y=Z=(a), each (X and Y) and (Y and Z) can bond with each other to form a satd. or unsatd. carbon ring.

Oxidation coupling of cpds. (II) and (III) gives a cpd. of formula (I).

USE/ADVANTAGE - The recording method is capable of giving printed images contg. magenta dye(s) of formula (I) with excellent hue. The solvent is water and/or organic solvents.

CHOSEN-DRAWING: Dwg.0/0

TITLE-TERMS: INK JET RECORD METHOD IMAGE HUE INK CONTAIN PYRAZOLE CONTAIN MAGENTA DYE

DERWENT-CLASS: A82 E23 G02 P75

CPI-CODES: A12-W07F; E25-C; G02-A04B; G05-F;

CHEMICAL-CODES:

Chemical Indexing M4 \*01\*

Fragmentation Code

C316	D011	D012	D013	D014	D016	D019	D022	D023	D024
D025	D040	D120	D140	D611	D622	D790	D800	D970	D980
E150	E260	F011	F012	F013	F014	F019	F020	F021	F029
F111	F199	F423	F431	F433	F499	F653	G010	G011	G012
G013	G015	G016	G017	G018	G019	G020	G021	G029	G030
G039	G040	G050	G100	G111	G112	G113	G553	G563	G599
H100	H101	H102	H103	H121	H122	H123	H141	H142	H143
H181	H201	H211	H401	H441	H481	H521	H522	H523	H541
H542	H543	H581	H592	H594	H599	H600	H602	H608	H609
H621	H641	H642	H643	J011	J012	J013	J014	J211	J231
J232	J271	J272	J311	J321	J331	J332	J341	J342	J371
J522	J581	J582	J583	K0	K353	K399	K431	K442	K499
L142	L143	L145	L199	L3	L355	L432	L462	L499	L930

L941 L943 L999 M1 M111 M112 M113 M114 M115 M116  
M119 M121 M122 M123 M124 M125 M126 M129 M132 M135  
M136 M139 M141 M142 M143 M147 M149 M150 M210 M211  
M212 M213 M214 M215 M216 M220 M221 M222 M223 M224  
M225 M226 M231 M232 M233 M240 M262 M271 M272 M273  
M280 M281 M282 M283 M311 M312 M313 M314 M315 M316  
M320 M321 M322 M323 M331 M332 M333 M340 M342 M349  
M373 M381 M383 M391 M392 M393 M412 M511 M512 M520  
M521 M522 M523 M530 M531 M532 M533 M540 M541 M542  
M543 M630 M781 M903 M904 Q332 Q338 R023 W003 W030  
W031 W032 W321 W333 W335 W336

## Ring Index

02371 03493 07879 07901 09893 40030 41758 50928 50929 59046

## Markush Compounds

199147-C7801-U 199147-C7802-U

## POLYMER-MULTIPUNCH-CODES-AND-KEY-SERIALS:

Key Serials: 0218 0231 0306 3159 0495 0500 3011 0535 0787 1095 2427 2430 2436 2504 2541 2651  
2725 2813

Multipunch Codes: 014 034 04- 040 055 056 066 067 074 076 077 081 082 117 122 27& 393 397 398  
431 436 442 477 575 592 593 659 660 688

## SECONDARY-ACC-NO:

CPI Secondary Accession Numbers: C1991-148821

Non-CPI Secondary Accession Numbers: N1991-263833

Full	Title	Citation	Front	Review	Classification	Date	Reference	Sequences	Attachments
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09/780,402  
09/744927

DERWENT-ACC-NO: 1991-344768  
DERWENT-WEEK: 199147  
COPYRIGHT 1999 DERWENT INFORMATION LTD

TITLE: Ink jet recording method giving images of good hue - using ink contg. pyrazole-contg. magenta dye

PATENT-ASSIGNEE: FUJI PHOTO FILM CO LTD [FUJF]

PRIORITY-DATA: 1990JP-0026406 (February 6, 1990)

PATENT-FAMILY:

PUB-NO	PUB-DATE	LANGUAGE	PAGES	MAIN-IPC
JP 03231975 A	October 15, 1991	N/A	000	N/A

APPLICATION-DATA:

PUB-NO	APPL-DESCRIPTOR	APPL-NO	APPL-DATE
JP03231975A	N/A	1990JP-0026406	February 6, 1990

INT-CL\_(IPC): B41M005/00; C09D011/00

ABSTRACTED-PUB-NO: JP03231975A

BASIC-ABSTRACT:

In an ink jet recording method where ink is spayed on an image-forming material in droplets to record images on it, the improvement which comprises that the ink contains a dye(s) of formula (I), where each R1-2=H, halogen, alkyl, cyaloalkyl, alkoxy, aryl, aryloxy, aralkyl, cyano, acylamino, sulphonylamino, ureide, alkythio, arylthio, alkoxy carbon yl, carbamoyl, sulphamoyl, sulphonyl, acyl or amino, each R3-4=H, alkyl, cycloalkyl, aralkyl or aryl, each R3 and 4, R2 and 3 and 4 can bond with each other to form a ring, =an integer of 0-3, each X, Y and Z=(a) or N, R5=H, alkyl, cycloalkyl, aralkyl, aryl, a heterocyclic ring, alkoxy, aryloxy or amino and, when X=Y=(a) or Y=Z=(a), each (X and Y) and (Y and Z) can bond with each other to form a satd. or unsatd. carbon ring.

Oxidation coupling of cpds. (II) and (III) gives a cpd. of formula (I).

USE/ADVANTAGE - The recording method is capable of giving printed images contg. magenta dye(s) of formula (I) with excellent hue. The solvent is water and/or organic solvents.

CHOSEN-DRAWING: Dwg.0/0

DERWENT-CLASS: A82 E23 G02 P75

CPI-CO

PTO 02-2477

Japan, Kokai  
3-231975

INK JET RECORDING METHOD  
[Inku Jetto Kiroku Hoho]

Mitsugu Tanaka and Hisashi Goshishiba

UNITED STATES PATENT AND TRADEMARK OFFICE  
Washington, D. C. May 2002

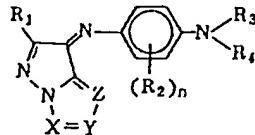
Translated by: Schreiber Translations, Inc.

Country : Japan  
Document No. : 3-231975  
Document Type : Kokai  
Language : Japanese  
Inventors : Mitsugu Tanaka and Hisashi Goshishiba  
Applicant : Fuji Photo Film Co., Ltd.  
IPC : C 09 D 11/00  
                  B 41 M 5/00  
                  C 09 D 11/02  
Application Date : February 6, 1990  
Publication Date : October 15, 1991  
Foreign Language Title : Inku Jetto Kiroku Hoho  
English Title : INK JET RECORDING METHOD

1. Title of the Invention:INK JET RECORDING  
METHOD2. Claims [amended]

1. An ink jet recording method with the following characteristics:  
In an ink jet recording method wherein a recording solution is sprayed onto an image reception material for recording an image, the following [sic: Presumably "aforementioned"] recording solution includes a dye represented by the general formula I:

General formula I:



In the formula, R<sub>1</sub> and R<sub>2</sub> are each selected from among a hydrogen atom, halogen atoms, alkyl groups, cycloalkyl groups, alkoxy groups, aryl groups, aryloxy groups, aralkyl groups, cyano group, acylamino groups, sulfonylamino groups, ureido groups, alkylthio groups, arylthio groups, alkoxy carbonyl groups, carbamoyl groups, sulfamoyl groups, sulfonyl groups, acyl groups, and amino groups, whereas R<sub>3</sub> and R<sub>4</sub> are each selected from among a hydrogen atom,

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1Numbers in the margin indicate pagination in the foreign text

alkyl groups, cycloalkyl groups, aralkyl groups, and aryl groups; R<sub>3</sub> and R<sub>4</sub> may be mutually coupled for forming a ring, and R<sub>2</sub> and R<sub>3</sub> or R<sub>2</sub> and R<sub>4</sub> may be coupled for forming a ring; n signifies an integer of 0 ~ 3; X, Y, and Z each signify  $\begin{array}{c} R_5 \\ | \\ -C- \end{array}$

or a hydrogen atom (wherein R<sub>5</sub> signifies a hydrogen atom, alkyl group, cycloalkyl group, aralkyl group, aryl group, heterocyclic group, alkoxy group, aryloxy group, or an amino group);

In a case where X and Y are  $\begin{array}{c} R_5 \\ | \\ -C- \end{array}$

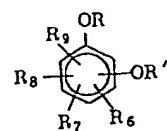
or where Y and Z are  $\begin{array}{c} R_5 \\ | \\ -C- \end{array}$

, furthermore, they may be mutually coupled for forming a saturated or unsaturated carbon ring.

2. The ink jet recording method specified in Claim 1 wherein a compound represented by the following general formula II is induced to coexist within said image:

General formula II:

/2



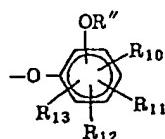
In the formula, R and R' are each selected from among a hydrogen atom, alkyl groups, acyl groups, and a sulfonyl group, whereas R<sub>6</sub>, R<sub>7</sub>, R<sub>8</sub>, and R<sub>9</sub> are each selected from among a hydrogen atom, alkyl groups, aryl groups, alkoxy groups, alkylthio groups, acylamino groups,

hydroxyl group, and halogen atoms; at least either of OR and OR' may optionally be mutually coupled with any member of R<sub>6</sub> ~ R<sub>9</sub> that exists at the corresponding ortho position for forming a 5-membered or 6-membered ring, or at least one set [sic: Presumably "pair?"] selected from among R<sub>6</sub> ~ R<sub>9</sub> that is characterized by a mutually ortho positional relationship may optionally be mutually coupled for forming a 5-membered or 6-membered ring.

3. The ink jet recording method specified in Claim 1 wherein the dye represented by general formula (I) includes no sulfo group, quaternary ammonium group, or carboxyl group and wherein the solvent of the recording solution is constituted mainly by an organic solvent(s).

4. The ink jet recording method specified in Claim 1 wherein the dye represented by general formula (I) includes at least one sulfo group, quaternary ammonium group, or carboxyl group and wherein the solvent of the recording solution is constituted mainly by an organic solvent(s).

5. The ink jet recording method specified in Claim 1 wherein the dye represented by general formula (I) includes a group represented by the following general formula III:



In the formula, R" signifies a hydrogen atom or alkyl group,

whereas  $R_{10}$ ,  $R_{11}$ ,  $R_{12}$ , and  $R_{13}$  are each selected from among a hydrogen atom, alkyl groups, aryl groups, alkoxy groups, alkylthio groups, acylamino groups, hydroxyl group, and halogen atoms; OR" may optionally be mutually coupled with any member of  $R_6 \sim R_9$  that exists at the corresponding ortho position for forming a 5-membered or 6-membered ring, or at least one set [sic: Presumably "pair?"] selected from among  $R_6 \sim R_9$  that is characterized by a mutually ortho positional relationship may optionally be mutually coupled for forming a 5-membered or 6-membered ring.

### 3. Detailed explanation of the invention

(Industrial application fields)

The present invention concerns an ink jet recording method, and in particular, it concerns an ink jet recording method wherein an image of an excellent hue is formed.

(Prior art)

Merits of recording methods which use ink jets include low material costs, possibility of high-speed recording, minimal recording noises, and the simplicity of color recording, and accordingly, these recording methods are expected to prosper in the future.

Inks which are currently being used for ink jet purposes can be classified into a format which uses an oily ink which includes an organic solvent of a high boiling point and a format which uses an aqueous ink which includes a water-miscible organic solvent. It is

necessary for a concomitantly used dye to satisfy the following requirements with regard to each format: Its solubility with a solvent must be high; its hue must be excellent; it must be stable both optically and thermally; its toxicity to humans must be minimal; its purity must be high; it must be inexpensively accessible; etc.

The selection of a dye which satisfies these requirements entails considerable difficulties, and in particular, a dye endowed with a satisfactory magenta hue has yet to be discovered.

(Problems to be solved by the invention)

The objective of the present invention is to solve the aforementioned problems of the prior art, and in particular, it provides an ink jet recording method which is suitable for forming an image which includes a magenta dye with a favorable hue.

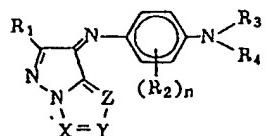
(Mechanism for solving the problems)

It was judged that the aforementioned problems can be solved by invoking a recording action by using an ink jet recording solution which includes a dye represented by the following general formula I, based on which the present invention has been completed.

In other words, the following are provided by the present invention:

(1): An ink jet recording method with the following characteristics: In an ink jet recording method wherein a recording solution is sprayed onto an image reception material for recording

an image, the following [sic: Presumably "aforementioned"] recording solution includes a dye represented by the general formula I:



In the formula, R<sub>1</sub> and R<sub>2</sub> are each selected from among a hydrogen atom, halogen atoms, alkyl groups, cycloalkyl groups, alkoxy groups, aryl groups, aryloxy groups, aralkyl groups, cyano group, acylamino groups, sulfonylamino groups, ureido groups, alkylthio groups, arylthio groups, alkoxy carbonyl groups, carbamoyl groups, sulfamoyl groups, sulfonyl groups, acyl groups, and amino groups, whereas R<sub>3</sub> and R<sub>4</sub> are each selected from among a hydrogen atom, alkyl groups, cycloalkyl groups, aralkyl groups, and aryl groups; R<sub>3</sub> and R<sub>4</sub> may be mutually coupled for forming a ring, and R<sub>2</sub> and R<sub>3</sub> or R<sub>2</sub> and R<sub>4</sub> may be coupled for forming a ring; n signifies an integer of 0 ~ 3; X, Y, and Z each signify  $\begin{array}{c} R_5 \\ | \\ -C- \end{array}$

or a hydrogen atom (wherein R<sub>5</sub> signifies a hydrogen atom, alkyl group, cycloalkyl group, aralkyl group, aryl group, heterocyclic group [amended], alkoxy group, aryloxy group, or an amino group);

In a case where X and Y are



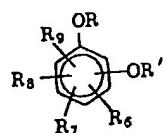
or where Y and Z are



, furthermore, they may be mutually coupled for forming a saturated or unsaturated carbon ring;

(2): The ink jet recording method specified in Embodiment (1) wherein a compound represented by the following general formula II is induced to coexist within said image:

General formula II:



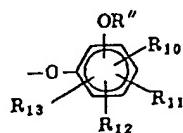
In the formula, R and R' are each selected from among a hydrogen atom, alkyl groups, acyl groups, and a sulfonyl group, whereas R<sub>6</sub>, R<sub>7</sub>, R<sub>8</sub>, and R<sub>9</sub> are each selected from among a hydrogen atom, alkyl groups, aryl groups, alkoxy groups, alkylthio groups, acylamino groups, hydroxyl group, and halogen atoms; at least either of OR and OR' may optionally be mutually coupled with any member of R<sub>6</sub> ~ R<sub>9</sub> that exists at the corresponding ortho position for forming a 5-membered or 6-membered ring, or at least one set [sic: Presumably "pair?"] selected from among R<sub>6</sub> ~ R<sub>9</sub> that is characterized by a mutually ortho positional relationship may optionally be mutually coupled for forming a 5-membered or 6-membered ring;

(3): The ink jet recording method specified in Embodiment (1) wherein the dye represented by general formula (I) includes no sulfo group, quaternary ammonium group, or carboxyl group [amended] and wherein the solvent of the recording solution is constituted

mainly by an organic solvent(s);

(4): The ink jet recording method specified in Embodiment (1) wherein the dye represented by general formula (I) includes at least one sulfo group, quaternary ammonium group, or carboxyl group [amended] and wherein the solvent of the recording solution is constituted mainly by an organic solvent(s);

(5): The ink jet recording method specified in Embodiment (1) wherein the dye represented by general formula (I) includes a group represented by the following general formula III:



In the formula, R" signifies a hydrogen atom or [amended] alkyl group, whereas R<sub>10</sub>, R<sub>11</sub>, R<sub>12</sub>, and R<sub>13</sub> are each selected from among a hydrogen atom, alkyl groups, aryl groups, alkoxy groups, alkylthio groups, acylamino groups, hydroxyl group, and halogen atoms; OR" may optionally be mutually coupled with any member of R<sub>6</sub> ~ R<sub>9</sub> that exists at the corresponding ortho position for forming a 5-membered or 6-membered ring, or at least one set [sic: Presumably "pair?"] selected from among R<sub>6</sub> ~ R<sub>9</sub> that is characterized by a mutually ortho positional relationship may optionally be mutually coupled for forming a 5-membered or 6-membered ring.

In the following, the general formula I will be explained in detail.

$R_1$  and  $R_2$  are each selected from among a hydrogen atom, halogen atoms (e.g., chlorine atom, bromine atom, etc.), alkyl groups (e.g., alkyl groups which contain 1 ~ 12 carbon atoms such as a methyl group, ethyl group, butyl group, isopropyl group, t-butyl group, hydroxyethyl group, methoxyethyl group, cyanoethyl group, trifluoromethyl group, etc.), cycloalkyl groups (e.g., cyclopentyl group, cyclohexyl

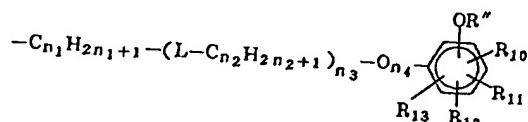
/4

group, etc.), alkoxy groups (e.g., alkoxy groups which contain 1 ~ 12 carbon atoms such as a methoxy group, ethoxy group, isopropoxy group, methoxyethoxy group, hydroxyethoxy group, etc.), aryl groups (e.g., phenyl group, p-tolyl group, p-methoxyphenyl group, p-chlorophenyl group, o-methoxyphenyl group, m-sulfopropylaminophenyl group, etc.), aryloxy groups (e.g., phenoxy group, p-methylphenoxy group, p-methoxyphenyl group, o-methoxyphenoxy group, etc.), aralkyl groups (e.g., benzyl group, 2-phenetyl group, etc.), cyano group, acylamino groups (e.g., acetylamino group, propionylamino group, isobutyroylamino group, benzoylamino group, m-sulfopropylaminobenzoylamino group, etc.), sulfonylamino groups (e.g., methanesulfonylamino group, benzenesulfonylamino group, trifluoromethanesulfonylamino group, etc.), ureido groups (e.g., 3-methylureido group, 3,3-dimethylureido group, 1,3-dimethylureido group, etc.), alkylthio groups (e.g., methylthio group, butylthio group, etc.), arylthio groups (e.g., phenylthio group, p-tolylthio group, etc.), alkoxycarbonyl groups (e.g., methoxycarbonyl group, ethoxycarbonyl group, etc.), carbamoyl groups (e.g.,

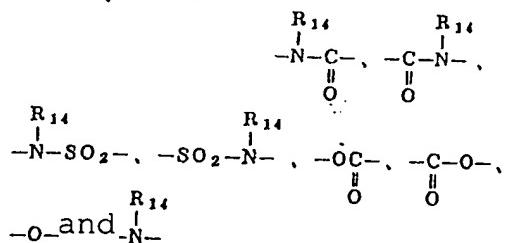
methylcarbamoyl group, dimethylcarbamoyl group, etc.), sulfamoyl groups (e.g., dimethylsulfamoyl group, diethylsulfamoyl group, etc.), sulfonyl groups (e.g., methanesulfonyl group, butanesulfonyl group, phenylsulfonyl group, etc.), acyl groups (e.g., acetyl group, butyroyl group, etc.), and amino groups (e.g., methylamino group, dimethylamino group, etc.).

Of these, alkyl groups which contain 8 or fewer carbon atoms, alkoxy groups which contain 8 or fewer carbon atoms, halogen atoms, and acylamino groups which contain 7 or fewer carbon atoms are especially desirable.

$R_3$  and  $R_4$  are each selected from among a hydrogen atom, alkyl groups (e.g., alkyl groups which contain 1 ~ 25 carbon atoms such as a methyl group, ethyl group, propyl group, isopropyl group, t-butyl group, hydroxyethyl group, cyanoethyl group,

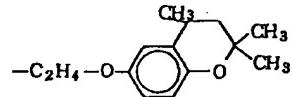


(wherein  $n_1$  and  $n_2$  each signify an integer of 1 ~ 5, whereas  $n_3$  and  $n_4$  each signify 0 or 1; L is selected from among

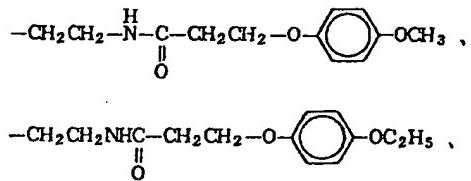


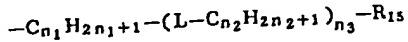
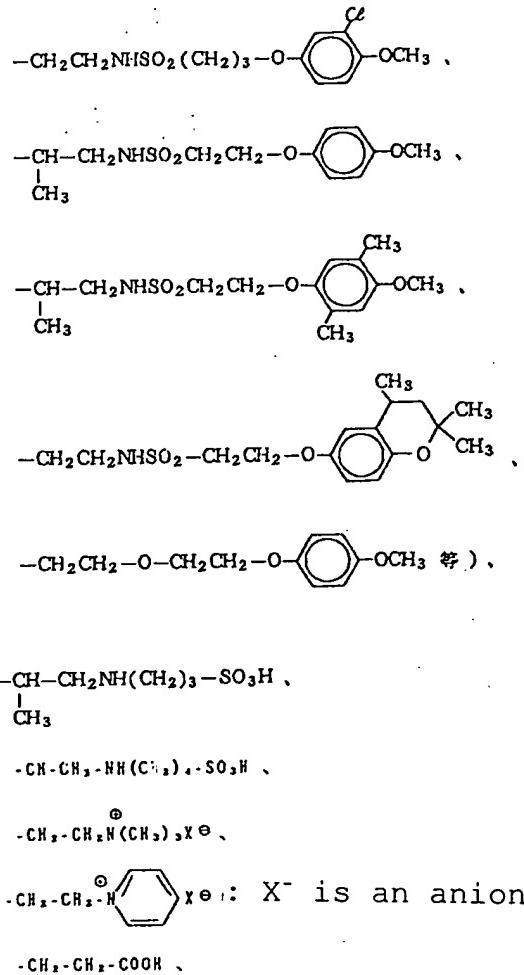
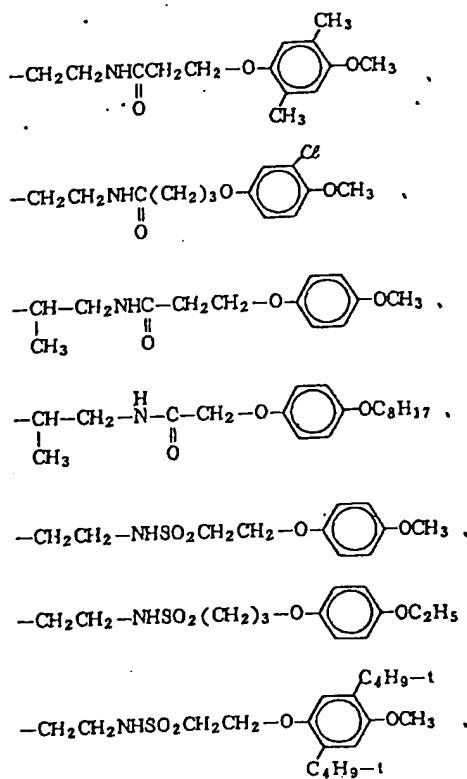
(wherein  $R_{14}$  signifies a hydrogen atom or alkyl group), whereas  $R''$  signifies an alkyl group, whereas  $R_{10}$ ,  $R_{11}$ ,  $R_{12}$ , and  $R_{13}$  are each selected from among a hydrogen atom, alkyl groups, aryl groups,

alkoxy groups, alkylthio groups, acylamino groups, hydroxyl group, and halogen atoms; -OR" may optionally be mutually coupled with any member of R<sub>9</sub> ~ R<sub>12</sub> that exists at the corresponding ortho position for forming a 5-membered or 6-membered ring, or at least one set [sic: Presumably "pair?"] selected from among R<sub>6</sub> ~ R<sub>9</sub> that is characterized by a mutually ortho positional relationship may optionally be mutually coupled for forming a 5-membered or 6-membered ring, cycloalkyl groups, aralkyl groups, and aryl groups; R<sub>9</sub> and R<sub>12</sub> may be mutually coupled for forming a ring; their concrete examples include 4-methoxyphenoxyethyl, 4-methoxyphenoxypropyl, 4-ethoxyphenoxyethyl, 3-methyl-4-methoxyphenoxyethyl, 2,5-dimethyl-4-methoxyphenoxyethyl, 2,5-dimethoxyphenylethyl, 3-chloro-4-methoxyphenoxyethyl,

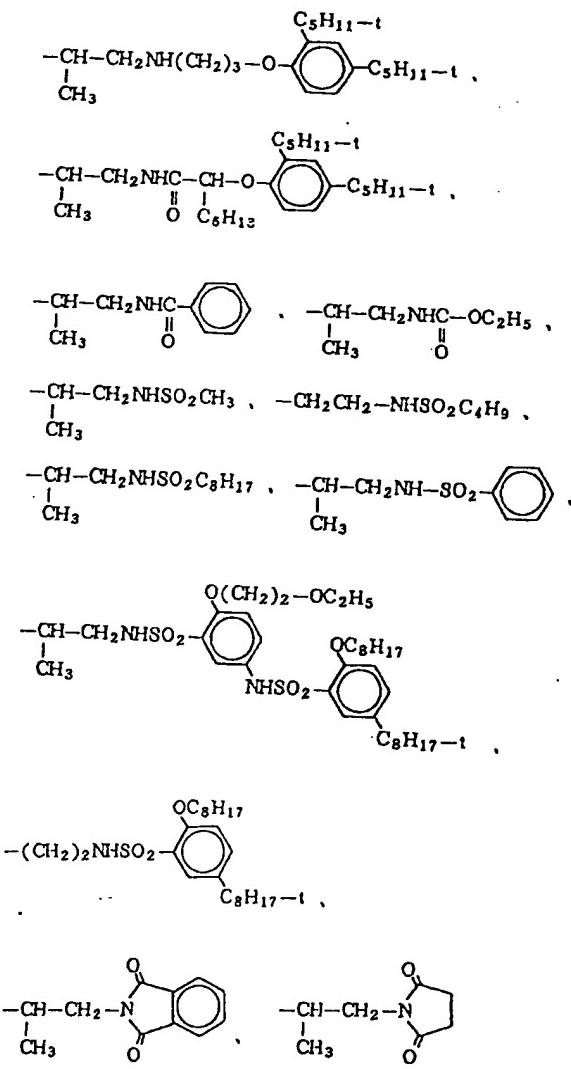
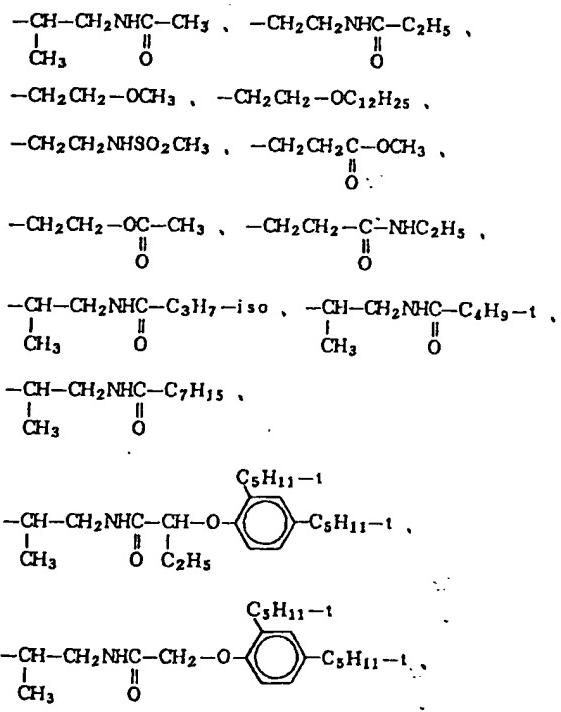


2,5-dimethoxyphenylethylcarbamoylethyl,  
 2,5-dimethoxyphenylpropylcarbamoylethyl,  
 4-methoxyphenoxyethylcarbamoylethyl,  
 3-methyl-4-methoxyphenoxyethylcarbamoylethyl, etc.), sulfopropyl group, sulfobutyl group,





herein  $n_1$ ,  $n_2$ ,  $n_3$ , and L are synonymous with the aforementioned definitions;  $R_{15}$  is an alkyl group, alkoxy group, or aryl group, and their concrete examples include



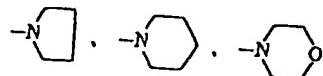
cycloalkyl groups (e.g., cyclopentyl group,

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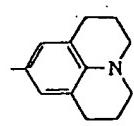
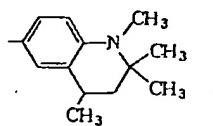
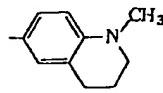
cyclohexyl group, etc.), aralkyl groups (e.g., benzyl group, 4-sulfobenzyl group, 2-phenethyl group, etc.), and aryl groups (e.g., phenyl group, p-tolyl group, etc.).

Of these, substituted or unsubstituted low-molecular-weight alkyl groups are especially desirable.

A case where a ring is formed as a result of the coupling of R<sub>3</sub> and R<sub>4</sub> (e.g.,



etc.) and a case where a ring is formed as a result of the coupling of R<sub>3</sub> or R<sub>4</sub> and R<sub>2</sub> (e.g.,



etc.) may also be mentioned as desirable examples.

X, Y, and Z each signify



or a hydrogen atom, whereas R<sub>5</sub> signifies a hydrogen atom, alkyl group (e.g., alkyl groups which contain 1 ~ 25 carbon atoms, which are concretely instantiated by those mentioned with regard to R<sub>3</sub> and R<sub>4</sub>), cycloalkyl group (e.g., cyclopentyl group, cyclohexyl group, etc.), aralkyl group (e.g., benzyl group, phenylethyl group,

etc.), aryl group (e.g., phenyl group, 3,5-dichlorophenyl group, 3-acetylaminophenyl group, 5-nitrophenyl group, 4-methylphenyl group, etc.), heterocyclic group (e.g., pyridinyl group, furanyl group, etc.), [amended] alkoxy group (e.g., methoxy group, ethoxy group, etc.), aryloxy group (e.g., phenoxy group, etc.), or an amino group.

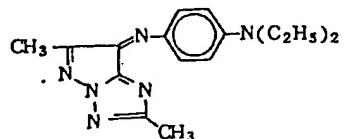
X, Y, and Z are favorably instantiated by a case where X, Y, and Z are simultaneously nitrogen atoms, a case where two of X, Y, and Z are nitrogen atoms, and a case where only one of X, Y, and Z is a nitrogen atom, and of these, the case where X, Y, and Z are simultaneously nitrogen atoms and the case where two of X, Y, and Z are nitrogen atoms are especially desirable.

Of the dyes represented by general formula I, dyes which include one or two groups represented by the aforementioned general formula III are especially desirable.

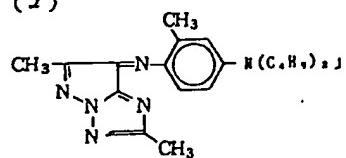
In a case where an oily ink is prepared, it is desirable for the dye represented by the general formula I not to include a sulfo group, whereas in a case where an aqueous ink is prepared, it is desirable for the same to include at least one sulfo group.

Concrete examples of dyes represented by the general formula I which can be used in the present invention are shown below. The present invention is in no way limited to them.

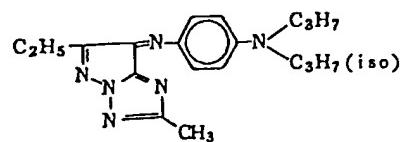
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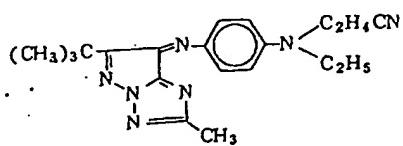
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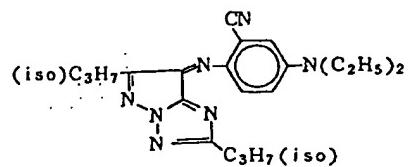
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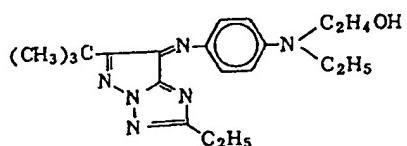
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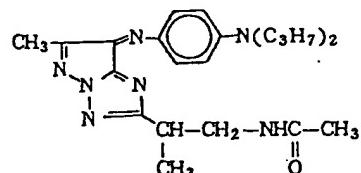
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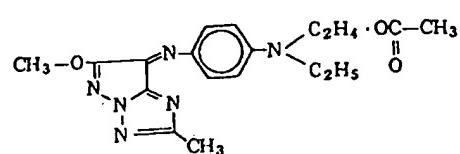
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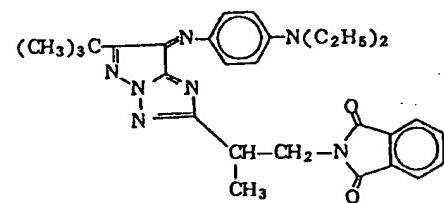
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(6)



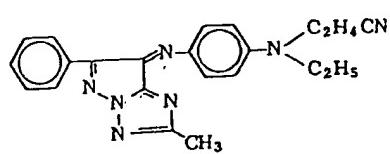
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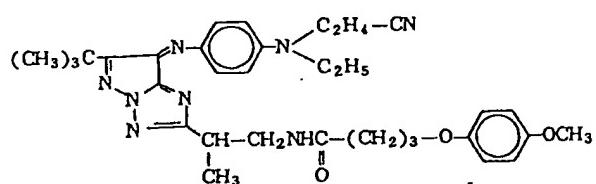
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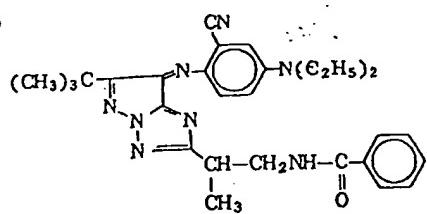
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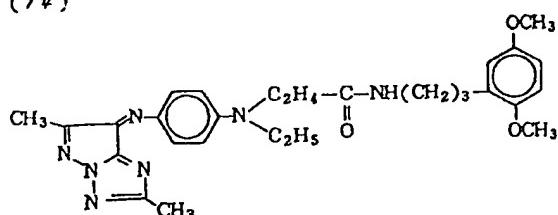
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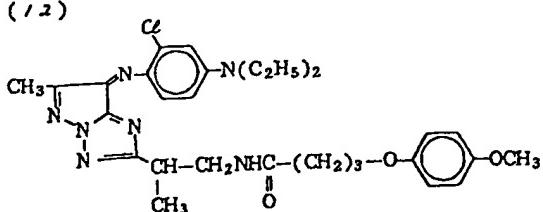
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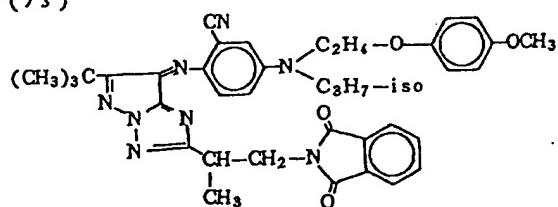
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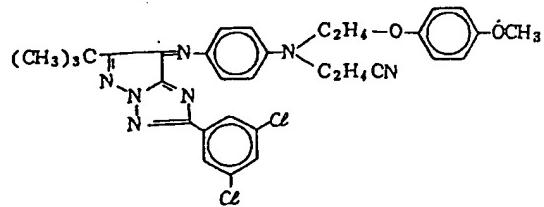
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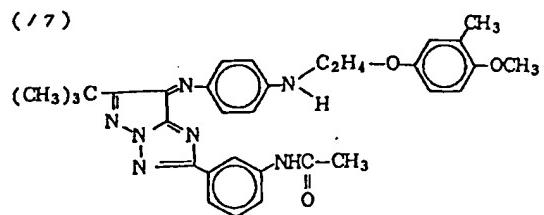
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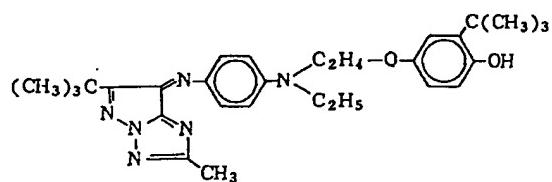
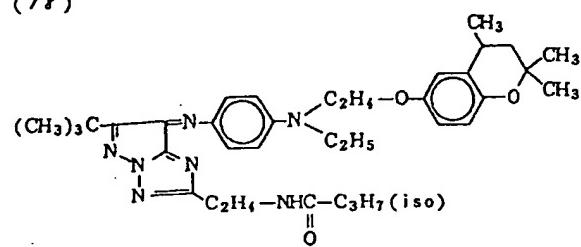
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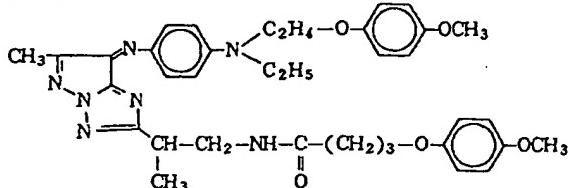
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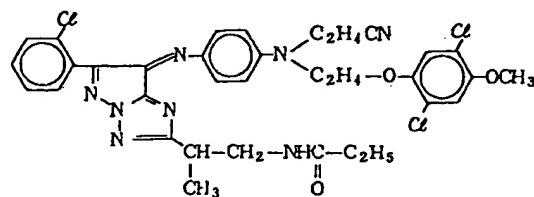
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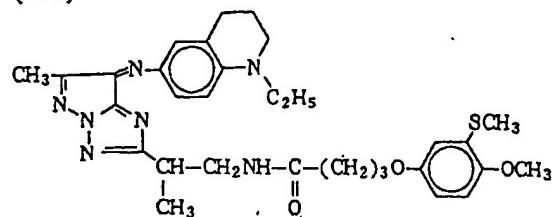
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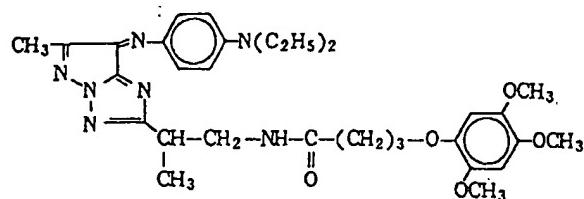
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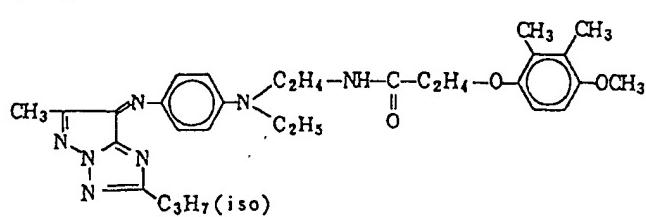
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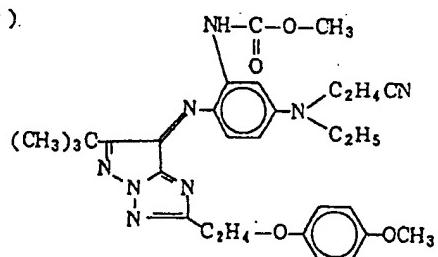
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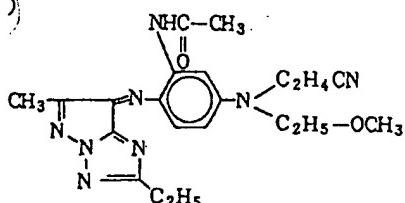
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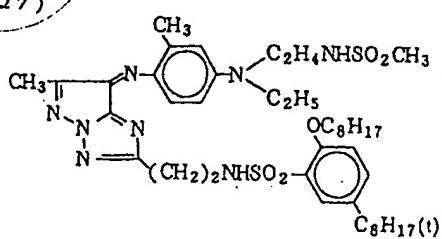
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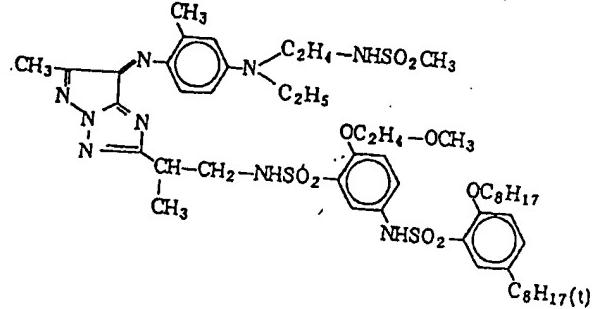
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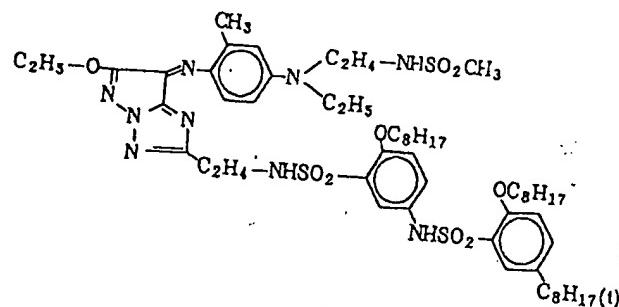
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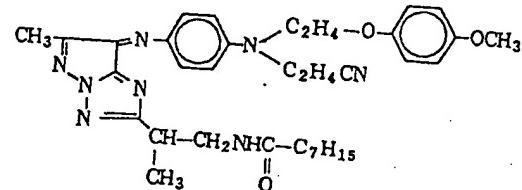


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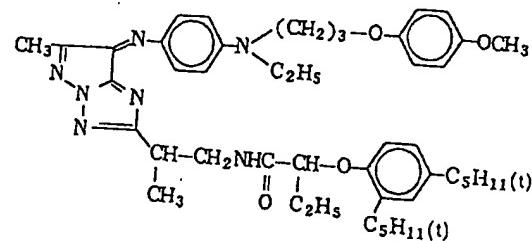


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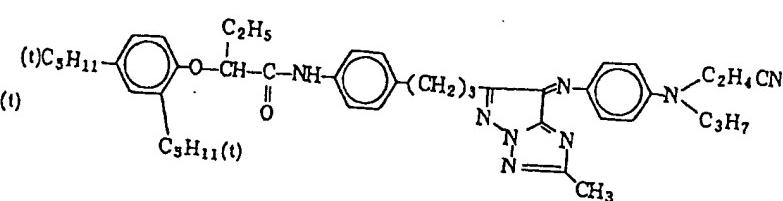
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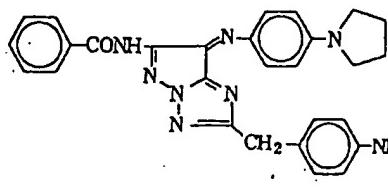
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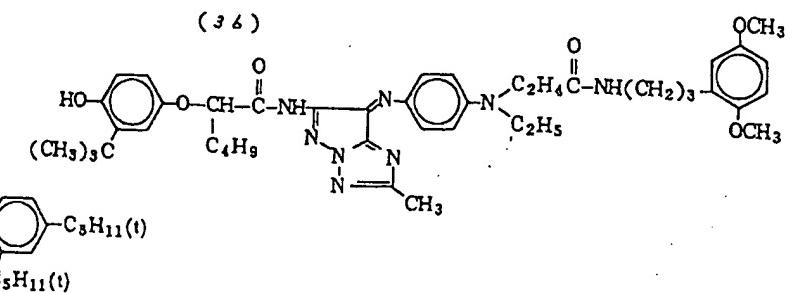
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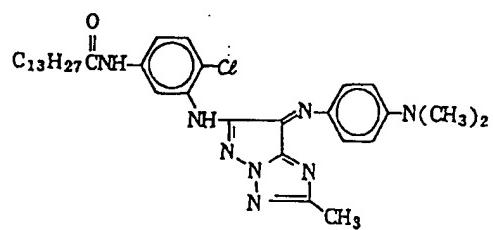
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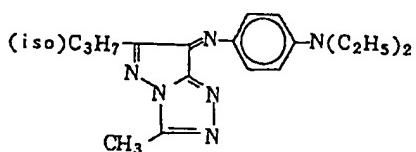
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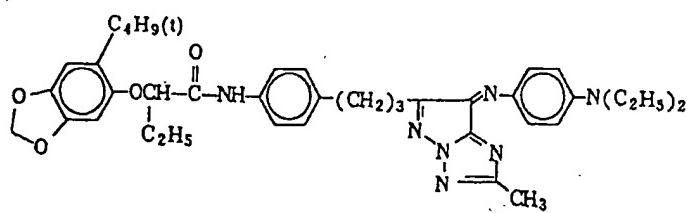
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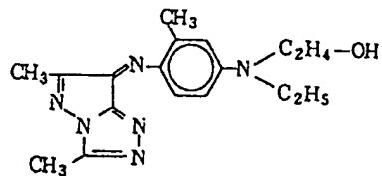
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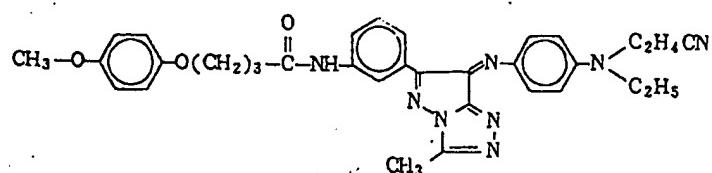


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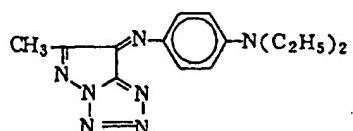


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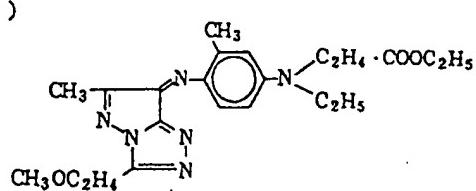
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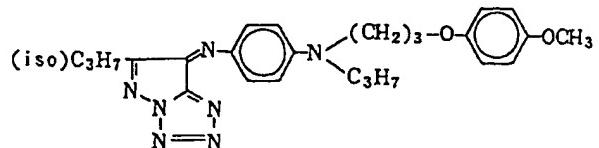
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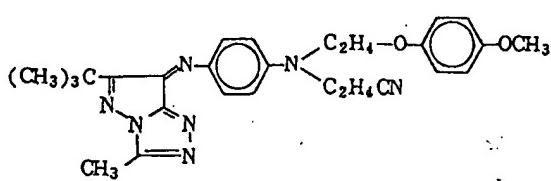
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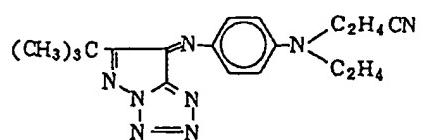
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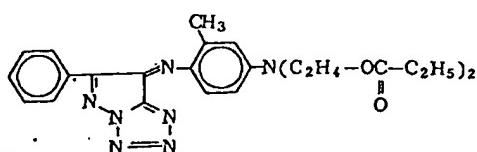
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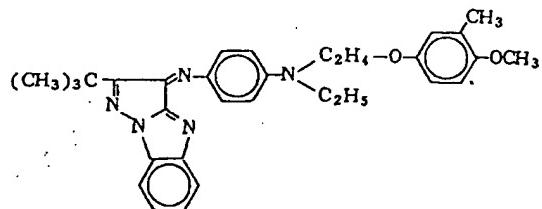
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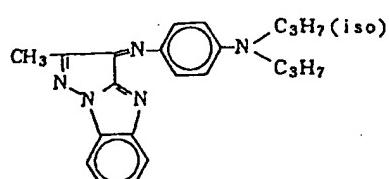
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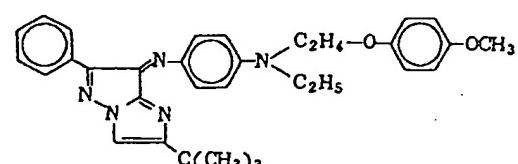
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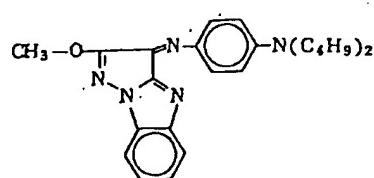
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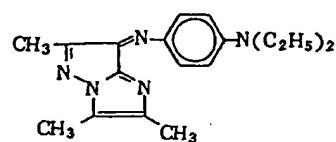
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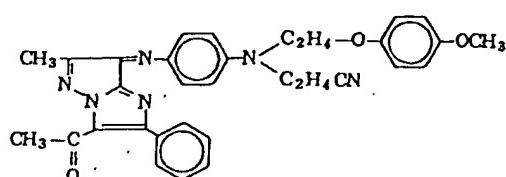
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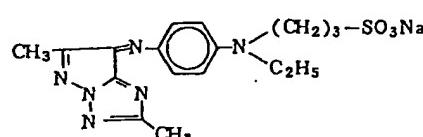
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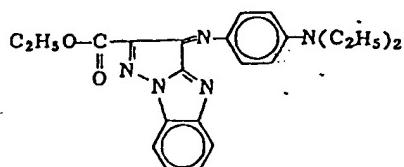
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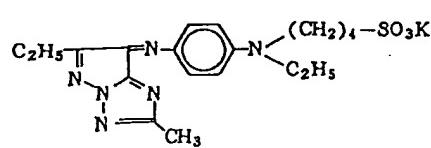
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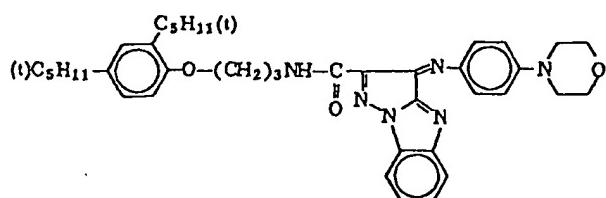
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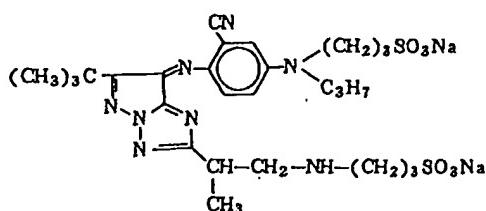
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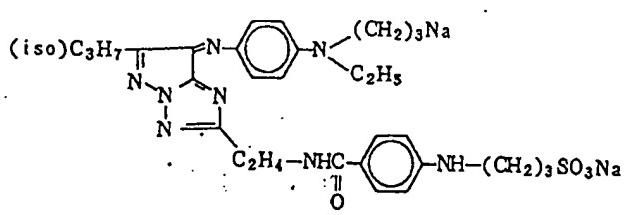
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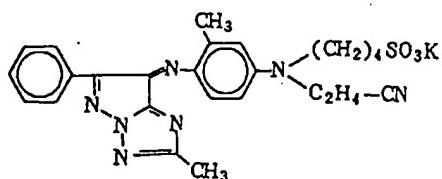
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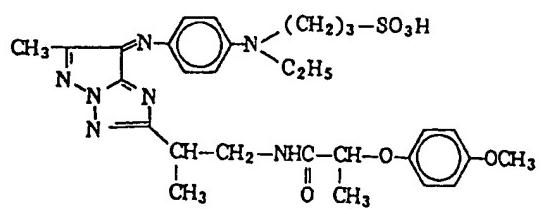
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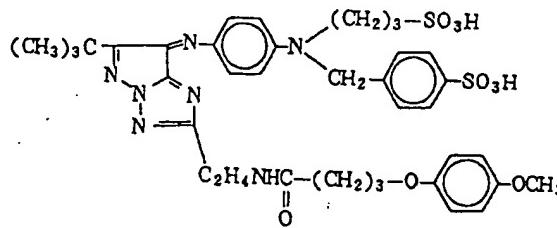
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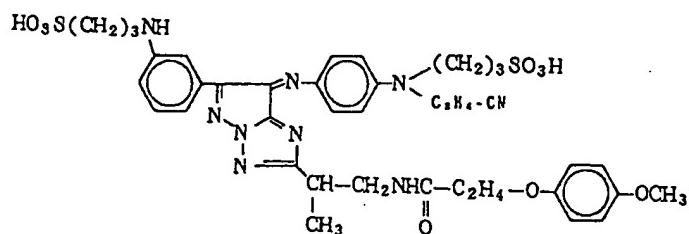
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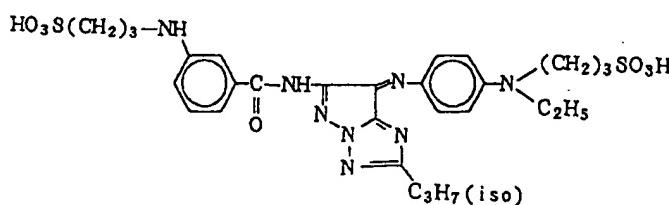
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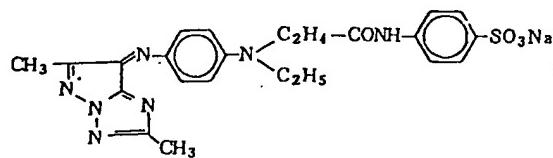
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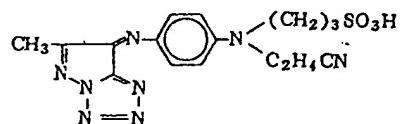
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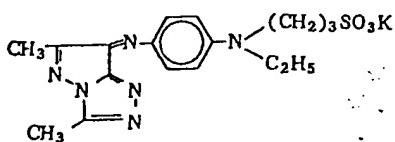
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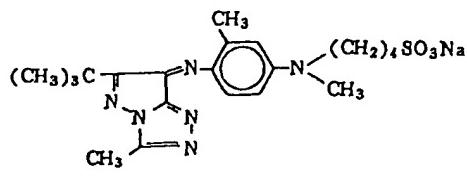
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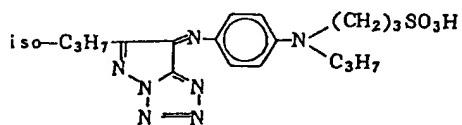
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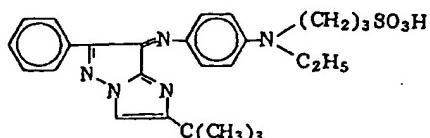
(66)

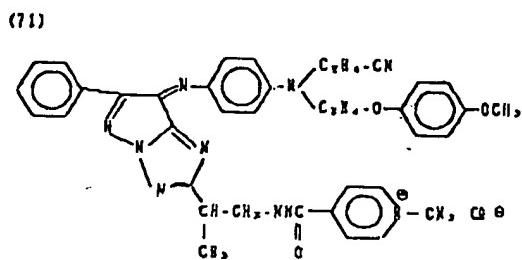
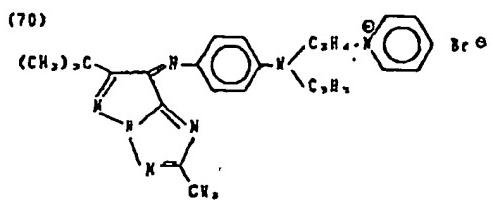
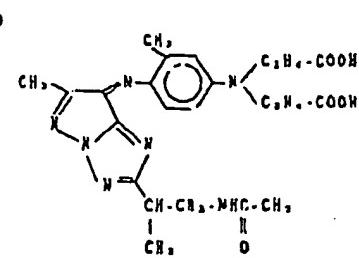
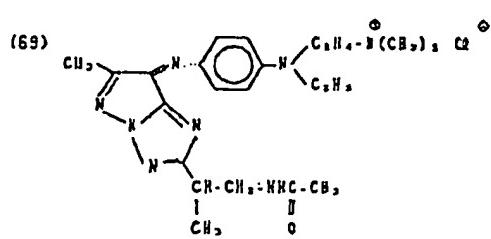


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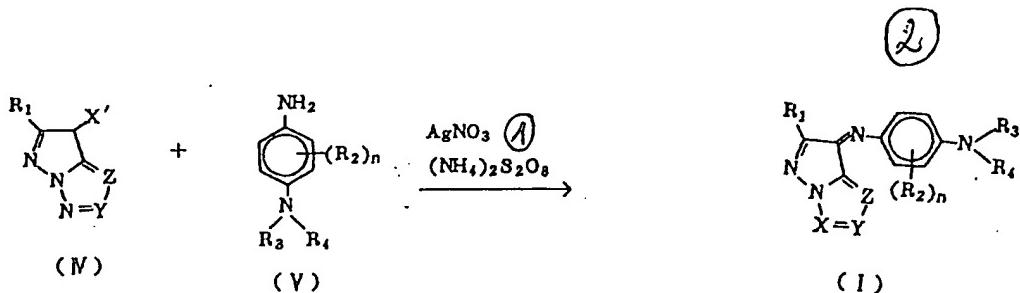
(68)





The dye represented by the general formula I can be obtained /15 as a result of the oxidative coupling of a ring-condensed pyrazole derivative represented by the following general formula IV and a p-phenylenediamine derivative represented by the following general formula V:

(1): Or; (2): X' signifies a hydrogen atom or dissociable group:



In the following, the format that uses an oily recording solution will be discussed.

The liquid medium for the recording solution to be used in the present invention is mainly selected from among ordinary solvents according to adventitious needs. They may, for example, be concretely instantiated by alcohols such as ethanol, pentanol, heptanol, octanol, cyclohexanol, benzyl alcohol, phenylethyl alcohol, phenylpropyl alcohol, furfuryl alcohol, anis alcohol, etc., glycol derivatives such as ethylene glycol monoethyl ether, ethylene glycol monophenyl ether, diethylene glycol monoethyl ether, diethylene glycol monobutyl ether, propylene glycol monoethyl ether, propylene glycol monophenyl ether, dipropylene glycol monomethyl ether, dipropylene glycol monoethyl ether, ethylene glycol diacetate, ethylene glycol monomethyl ether acetate, diethylene glycol monoethyl acetate, ethylene glycol

diacetate, propylene glycol diacetate, etc., ketones such as benzyl methyl ketone,

/16

benzylacetone, diacetone alcohol, cyclohexanone, etc., ethers such as butylphenyl ether, benzylethyl ether, hexyl ether, etc., esters such as ethyl acetate, amyl acetate, benzyl acetate, phenylethyl acetate, phenoxyethyl acetate, ethyl phenylacetate, benzyl propionate, ethyl benzoate, butyl benzoate, ethyl laurate, butyl laurate, isopropyl myristate, isopropyl palmitate, triethyl phosphate, tributyl phosphate, diethyl phthalate, dibutyl phthalate, diethyl malonate, dipropyl malonate, diethyl diethylmalonate, diethyl succinate, dibutyl succinate, dimethyl glutarate, diethyl glutarate, diethyl adipate, dipropyl adipate, dibutyl adipate, di(2-methoxyethyl) adipate, diethyl sebacate, diethyl maleate, dibutyl maleate, dioctyl maleate, diethyl fumarate, dioctyl fumarate, 3-hexenyl cinnamate, etc., hydrocarbon-type solvents such as petroleum ether, petroleum benzil, tetralin, decalin, [t]-amylbenzene, dimethylnaphthalene, etc., and polar solvents such as acetonitrile, formamide, N,N-dimethylformamide, dimethyl sulfoxide, sulfolane, propylene carbonate, N-methyl-2-pyrrolidone, N-ethyl-2-pyrrolidone, N-vinyl-2-pyrrolidone, N,N-diethyldodecaneamide, etc. These solvents may be used alone or as mixtures of two or more types. Ones which include two ester groups are desirable as such solvents, and ones the boiling points of which are 140°C or higher are especially desirable as such solvents.

It is desirable for the internalization ratio of the dye of the present invention represented by the general formula I with respect to 100 parts by weight of the recording solution to be 0.2 ~ 10 parts by weight.

Another magenta dye may, if necessary, be added adventitiously to the recording solution which is used in the present invention.

Various additives may be added to the recording solution of the present invention according to adventitious needs. Concrete examples of such additives include viscosity adjustment agents, surface tension adjustment agents, specific resistivity adjustment agents, film formation enhancers, ultraviolet absorbents (desirable ultraviolet absorbents are the benzotriazoles mentioned in Japanese Patent Application Publication No. Kokai Sho 60[1985]-262159), antioxidants, antifading agents, etc.

Next, the compound represented by the general formula II will be discussed in further detail.

R and R' are each selected from among a hydrogen atom, linear, branched, or cyclic alkyl groups which contain 1 ~ 20 carbon atoms (e.g., methyl group, ethyl group, propyl group, n-butyl group, iso-butyl group, n-octyl group, n-dodecyl group, n-hexadecyl group, cyclohexyl group, etc.), acyl groups which contain 1 ~ 20 carbon atoms (e.g., acetyl group, propionyl group, octanoyl group, benzoyl group, etc.), and sulfonylamino groups which contain 1 ~ 20 carbon atoms (e.g., methylsulfonyl group, propylsulfonyl group, phenylsulfonyl group, etc.), and they may be mutually identical or different.

Alkyl groups which contain 1 ~ 10 carbon atoms are especially desirable as R and R'. R<sub>6</sub>, R<sub>7</sub>, R<sub>8</sub>, and R<sub>9</sub> are each selected from among a hydrogen atom, linear, branched, or cyclic alkyl groups which contain 1 ~ 20 carbon atoms (e.g., methyl group, ethyl group, t-butyl group, t-hexyl group, t-octyl group, sec-dodecyl group, n-hexadecyl group, cyclohexyl group, etc.), aryl groups which contain 6 ~ 20 carbon atoms (e.g., phenyl group, naphthyl group, etc.), alkoxy groups which contain 1 ~ 20 carbon atoms (e.g., methoxy group, ethoxy group, n-butoxy group, iso-butoxy group, n-octyloxy group, n-hexadecyloxy group, etc.), alkylthio groups which contain 1 ~ 20 carbon atoms (e.g., methylthio group, n-butylthio group, n-octylthio group, etc.), acylamino groups which contain 1 ~ 20 carbon atoms (e.g., acetylamino group, propionylamino group, etc.), hydroxyl group, and halogen atoms (e.g., chlorine atom, bromine atom, etc.), and they may be mutually identical or different. At least either of OR and OR' may optionally be mutually coupled with any member of R<sub>6</sub> ~ R<sub>9</sub> that exists at the corresponding ortho position for forming a 5-membered or 6-membered ring (e.g., chroman ring, spirochroman ring, coumarane ring, coumaran ring, etc.), or at least one set [sic: Presumably "pair?"] selected

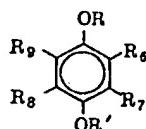
/17

from among R<sub>6</sub> ~ R<sub>9</sub> that is characterized by a mutually ortho positional relationship may optionally be mutually coupled for forming a 5-membered or 6-membered ring (e.g., fat ring, hetero ring, aromatic ring, spiro ring, etc.). Of the groups cited above expressed by R, R', R<sub>6</sub>, R<sub>7</sub>, R<sub>8</sub>, and R<sub>9</sub>, groups which include partial

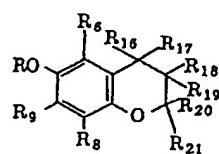
alkyl [or] aryl segments may be further substituted with substituents. Desirable substituents are instantiated by alkyl groups, aryl groups, alkoxy groups, aryloxy groups, alkylthio groups, arylthio groups, acyl groups, acylamino groups, hydroxyl group, halogen atoms, cyano group, alkoxycarbonyl groups, carbamoyl groups, sulfamoyl groups, acyloxy groups, nitro group, etc.

Of the compounds represented by the general formula II, one wherein OR' is located at the ortho position or para position of OR is desirable in consideration of the effects of the present invention, and compounds represented by the following general formula II-1, II-2, II-3, II-4, or II-5 are more desirable:

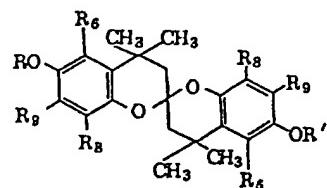
General formula II-1:



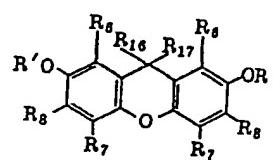
general formula II-2:



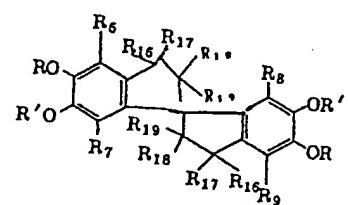
general formula II-3:



General formula II-4:



General formula II-1:



R, R', R<sub>6</sub>, R<sub>7</sub>, R<sub>8</sub>, and R<sub>9</sub> in the respective compounds represented by the general formulae II-1 through II-5 are identical to their counterparts in general formula II. R<sub>16</sub>, R<sub>17</sub>, R<sub>18</sub>, R<sub>19</sub>, R<sub>20</sub>, and R<sub>21</sub>, which may be mutually identical or different, are each selected from among a hydrogen atom, alkyl groups (e.g., linear, branched, or cyclic alkyl groups which contain 1 ~ 20 carbon atoms such as a methyl group, ethyl group, n-butyl group, n-octyl group, cyclohexyl group, etc.), aryl groups (e.g., aryl groups which contain 6 ~ 20 carbon atoms such as a phenyl group, naphthyl group, etc.), alkoxy groups (e.g., alkoxy groups which contain 1 ~ 20 carbon atoms such as a methoxy group, n-butoxy group, n-octyloxy group, etc.), heterocyclic groups (e.g., morpholinyl group, etc.), alkylamino groups (e.g., alkylamino groups which contain 1 ~ 20 carbon atoms such as a diethylamino group, dibutylamino group, n-octylamino group, etc.), and alkoxycarbonyl groups (e.g., alkoxycarbonyl groups which contain 1 ~ 20 carbon atoms such as an ethoxycarbonyl group, n-hexyloxycarbonyl group, etc.).

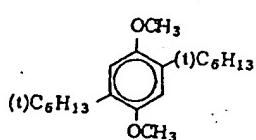
The compound of the present invention represented by the general formula II is used as an antifading agent, and it may be used alone, or two or more types may be used together, and it may also be used in combination with another conventionally-known antifading agent(s).

Concrete examples of such conventionally-known antifading agents include hydroquinones, phenols, chromanols, coumarans, hindered amines, [their?] complexes, etc., and they are mentioned, for example, in the respective specifications of Japanese Patent

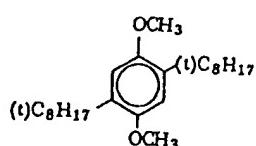
Application Publication No. Kokai Sho 59[1984]-83162, Sho 58[1983]-24141, and Sho 52[1977]-152225, U.S. Patent No. 3,698,907, and 4,268,593, British Patent Nos. 2,069,162 (A) and 2,027,731.

Concrete examples of the compounds represented by the general formula II are shown below, although they do not constitute an exhaustive list.

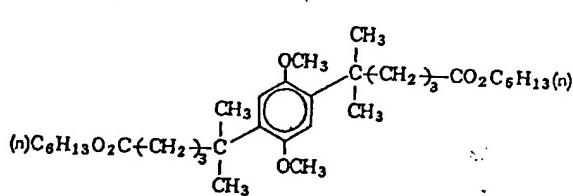
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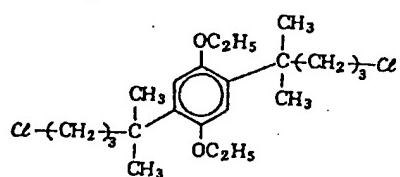
( A - 2 )



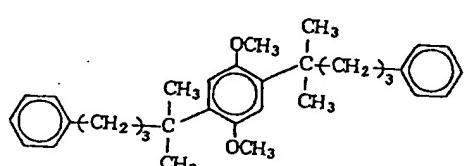
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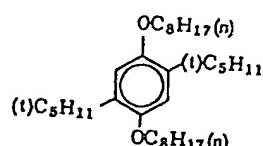
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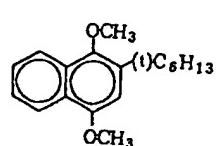
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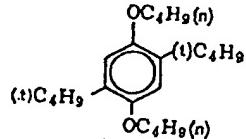
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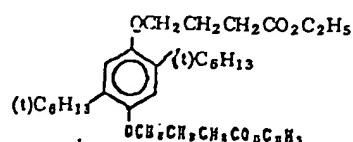
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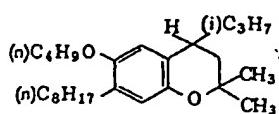
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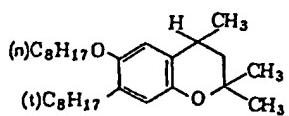
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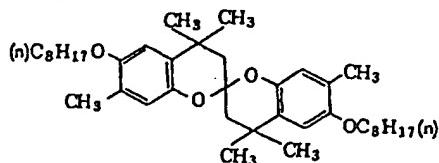
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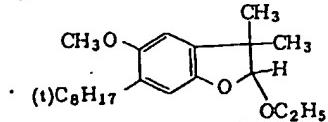
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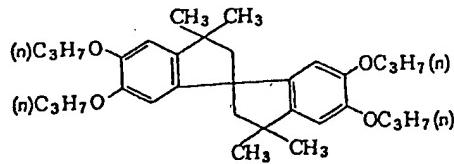
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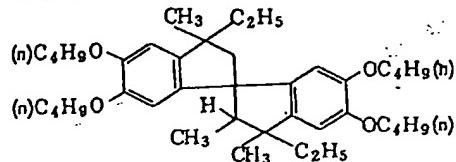
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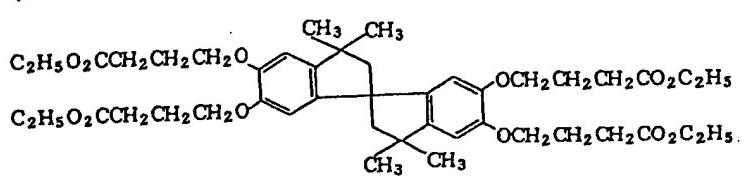
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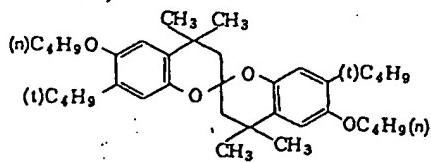
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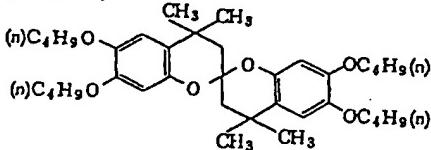
( A - 20 )



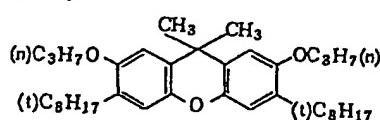
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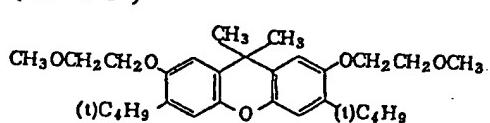
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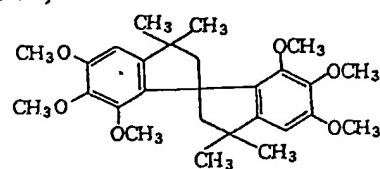
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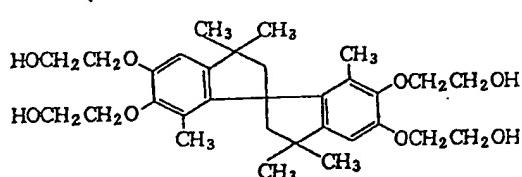
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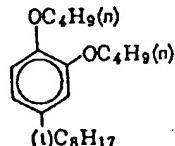
( A - 21 )



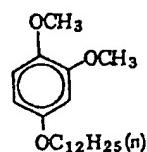
( A - 22 )



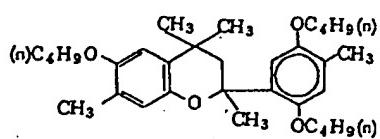
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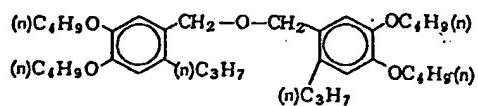
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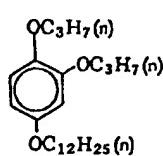
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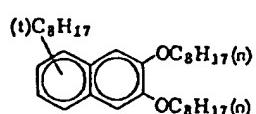
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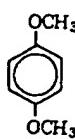
( A - 2 7 )



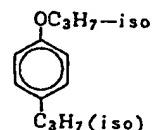
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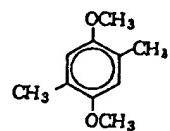
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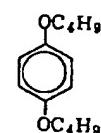
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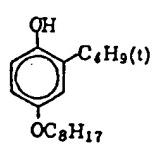
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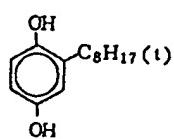
( A - 3 2 )



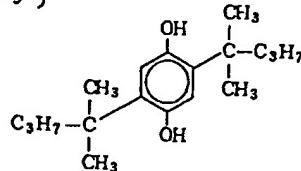
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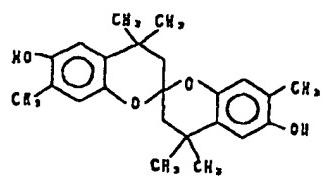
( A - 3 4 )



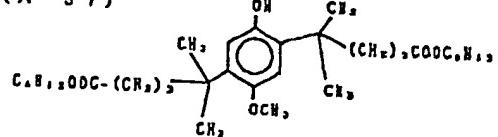
( A - 3 5 )



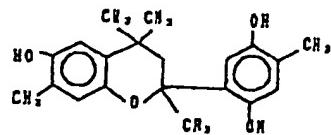
( A - 3 6 )



( A - 3 7 )



( A - 3 8 )



//in compliance with the attached amendments, the crossed-out portion of [A-9] is substituted with [K] on p. 825, and Addendum 3 on p. 827 is inserted after [A-35]// /18-19,29

The compound of the present invention represented by the /20 general formula II can be easily synthesized based on the methods mentioned respectively in U.S. Patent Nos. 4,360,589 and 4,273,864, Japanese Patent Application Publication No. Kokai Sho 55[1980]-50244, Sho 53[1978]-20327, Sho 53[1978]-77526, and Sho 59[1984]-10539, and Japanese Patent Publication No. Kokoku Sho 57[1982]-37856 or methods equivalent to them.

The compound of the present invention represented by the general formula II may be internalized into the recording solution of the present invention, or it may be sprayed from a separate nozzle in the form of liquid droplets. It may, for example, be internalized into an image reception material on which an image is scheduled to be recorded. In essence, it simply needs to coexist with the dye of the present invention represented by the general formula I within an image. It is desirable for its coexistence ratio with respect to said dye to be designated within a range of 0.5 ~ 200 wt%, preferably 2 ~ 150 wt%.

The magenta color recording solution of the present invention may be used together with a cyan color or yellow color recording solution in the context of forming a full color image. It may, for example, be used in combination with a black color recording solution for the purpose of adjusting the color tone. Concrete examples of dyes which can be used in these recording solutions

include dyes mentioned in Japanese Patent Application Publication No. Kokai Sho 63[1988]-215252, etc. (e.g., various azo dyes such as monoazo, polyazo, metal complex salt azo, pyrazoloneazo, aminopyrazoleazo, stilbeneazo, thiazoleazo, etc., anthraquinone dyes which consist of anthrone and/or anthraquinone derivatives, etc., indigoid dyes which consist of indigo and/or thioindigo derivatives, phthalocyanine dyes, diphenylmethane, triphenylmethane, xanthene, acridinic carbonium dyes, azinic, oxazinic, and/or thiazinic quinoneimine dyes, polymethinic and/or azomethinic methine dyes, benzoquinone or naphthoquinone dyes, naphthalimide dye, perynone dye, etc.), and ones with cyan hues, yellow hues, or black hues are selected from among them. Of these, especially desirable ones are shown below:

Cyan dyes: Phthalocyanine dyes mentioned in Japanese Patent Application Publication No. Kokai Sho 64[1989]-20278 and/or indoaniline dyes mentioned in Japanese Patent Application Publication No. Kokai Hei 1[1989]-16679;

Yellow dyes: Azo dyes mentioned in Japanese Patent Application Publication No. Kokai Hei 1[1989]-103675;

Black dyes: Metal chelate dyes mentioned in Japanese Patent Application Publication No. Kokai Sho 64[1989]-16880.

Solvent components or various additives may adventitiously be added to the recording solution to be used in the present invention, and said solutions are applied to a variety of ink jet recording devices after their physical attribute values have been properly adjusted.

In a case where the recording solution to be used in the present invention is applied to an ink jet recording method which uses the electrostatic energy, it is desirable for the specific resistivity of said recording solution to be adjusted within a range of  $10^5$  ~  $10^{11}$   $\Omega\cdot\text{cm}$ , preferably  $10^6$  ~  $10^8$   $\Omega\cdot\text{cm}$ . It is desirable, furthermore, for the viscosity of said recording solution to be adjusted within a range of 1 ~ 30 cP, preferably 3 ~ 20 cP (measured at 25°C).

Concrete examples of substances which can be used for forming an ink absorption layer on an image reception material include fine organic polymer particles, inorganic pigments, thermocurable resins, organic pigments, organic polymer emulsions, water-soluble organic polymers, ultraviolet absorbents, optical stabilizers, antioxidants, antifading agents, fluorescent dyes, auxiliary coating agents, etc., and appropriate ones are adventitiously selected from among them in consideration of objectives.

The fine organic polymer particles are used for at least partially solubilizing the liquid medium of the recording solution to be used, and they are instantiated by vinyl resins (e.g., polyvinyl chloride, vinyl chloride-vinyl acetate copolymer, vinyl chloride-vinylidene chloride copolymer, polyvinyl acetate, ethylene-vinyl acetate copolymer, etc.), styrene resins (e.g., polystyrene, styrene-acrylic acid ester copolymer, styrene, butadiene [sic: Presumably "styrene-butadiene"] copolymer, styrene-acrylonitrile copolymer, styrene-acrylonitrile copolymer, styrene-maleic anhydride copolymer, etc.), acrylic resins (e.g., polyacrylic acid ester, methyl methacrylate, butadiene [sic: Presumably "methacrylate-butadiene"] copolymer,

polyacrylonitrile, etc.), etc.

The fine organic polymer particles may be hollow particles, capsule particles, or core-shell particles constituted by two types of organic polymers. It is desirable for the particle sizes of the fine organic polymer particles to be confined to a range of  $0.2 \mu \sim 10 \mu$ , preferably  $0.4 \mu \sim 5 \mu$ . It is also possible to internalize ultraviolet stabilizers (preferred ultraviolet absorbents are the benzotriazoles mentioned in Japanese Patent Application Publication No. Kokai Sho 60[1985]-262159), antifading agents, antioxidants, fluorescent dyes, etc. into the  
fine organic polymer particles. The aforementioned compounds represented by the general formula II are desirable as said antifading agents. /21

Concrete examples of inorganic pigments include kaolin, clay, acidic clay, talc, calcium carbonate, silica, synthetic aluminum silicate, synthetic calcium silicate, alumina white, aluminum hydroxide, diatomaceous earth, zeolite, barium sulfate, zinc oxide, titanium white, lithopone, etc. Fine urea resin particles, fine melamine resin particles, fine benzoguanamine resin particles, etc. can be employed as thermocurable resin pigments. Polyvinyl chloride, polyvinylidene chloride, vinyl chloride-vinyl acetate copolymer, polyvinyl acetate, ethylene-vinyl acetate copolymer, polystyrene, styrene-acrylic acid ester copolymer, polyacrylic acid ester, styrene-butadiene copolymer, methyl methacrylate-butadiene copolymer, methacrylate-butadiene copolymer, polyacrylonitrile, polystyrene, acetonitrile, polyester, etc. can be employed as organic polymer

emulsions. Starch, sodium alginate, gelatin, casein, methyl cellulose hydroxyethyl cellulose carboxymethyl cellulose, polyvinyl alcohol, polysodium acrylate, ethylene-maleic anhydride copolymer, styrene-maleic anhydride copolymer, vinyl acetate-maleic anhydride copolymer, polyacrylamide, sodium polystyrenesulfonate, polyvinylbenzyltrimethyl ammonium chloride, polyethyleneimine, polyethylene oxide, polyvinyl pyrrolidone, etc. can be employed as water-soluble organic polymers.

It is desirable for at least one type of fine organic polymer particles to be internalized into a substance used for forming the ink absorption layer.

The coating rate of the ink absorption layer is normally designated within a range of  $1 \sim 40 \text{ g/m}^2$ , preferably  $5 \sim 15 \text{ g/m}^2$ , depending on the absorption capacity of the ink absorption layer and the ink extrusion rate.

A coating operation is necessary carried out by using water or an organic solvent as a dispersion medium, although an electrostatic coating operation can also be carried out by using air as a dispersion medium.

An air knife coater, blade coater, roll coater, bar coater, curtain coater, etc. can be used as coating mechanisms. Depending on objectives, furthermore, two or more types of coating solutions with mutually different performances may be coated in multiple layers. It is necessary for the post-coat drying temperature to be designated within a range over which the particle morphology of the fine organic polymer particles can be retained. A treatment for flattening the

surface of the ink absorption layer may also be performed after the coating and drying operations by using a machine calender, gloss calender, super calender, etc. Depressions and protrusions can, furthermore, be formed on the surface of the ink absorption layer by using an embossing roll.

Papers, cloths, plastic films, metallic films, metallic sheets, wooden sheets, glass sheets, etc. can be used as substrates. The paper consists principally of wooden pulp, although it may also be mixed with a synthetic pulp, synthetic fiber, and/or inorganic fiber. Depending on objectives, furthermore, sizing agents (e.g., rosin, alkyl ketene dimer, alkenylsuccinic acid, etc.), fillers (e.g., clay, talc, calcium carbonate, etc.), paper strength enhancers (e.g., starch, polyacrylamide, etc.), dyes, fluorescent dyes, etc. may also be used as paper additives. It is also possible to coat starch, polyvinyl alcohol, styrene-maleic anhydride copolymer, etc. on the paper by using a size press.

In the following, the format that uses an aqueous recording solution will be discussed.

This recording solution includes water as a main solvent, and its composition additionally includes a hydrophilic organic solvent and a hydrophilic dye as well as, if necessary, various additives.

As far as the recording solution of the present invention is concerned, it is normally appropriate to internalize 0.2 ~ 10 wt% [sic: Presumably "parts by weight"] of the dye of the present invention within 100 parts by weight of the recording solution.

A humidifying agent may be internalized into the recording solution of the present invention. Such a humidifying agent may be added as an agent for improving the dryness resistance of the recording solution and/or for facilitating the solubilization of the dye, and as such, ones which are virtually non-volatile at normal temperature, the surface tension of which at normal temperature is 20 dyne/cm or higher, preferably 20 dyne/cm or higher, as a 10 ~ 20 wt% aqueous solution, and which is capable of solubilizing at least 0.5 wt% of the aforementioned water-soluble dye at normal temperature are desirable.

These humidifying agents are favorably instantiated by 2-pyrrolidones mentioned in Japanese Patent Application /22 Publication No. Kokai Sho 50[1975]-71423, Sho 51[1976]-5127, and Sho 51[1976]-137505,

1,3-dialkyl-2-imidazolidinones mentioned in Japanese Patent Application Publication No. Kokai Sho 55[1980]-71768, Carboxylic acid amide derivatives mentioned in Japanese Patent Application Publication No. Kokai Sho 49[1974]-97620, Sho 51[1976]-8031, and Sho 51[1976]-8033,

Lactones mentioned in Japanese Patent Application Publication No. Kokai Sho 55[1980]-48267,

Dioxyethylene-sulfur compounds mentioned in Japanese Patent Application Publication No. Kokai Sho 51[1976]-5129,

Alcoholamines mentioned in Japanese Patent Application Publication No. Kokai Sho 51[1976]-52004,

N-formyllactam derivatives mentioned in Japanese Patent Application

Publication No. Kokai Sho 51[1976]-51525,

Sulfolane derivatives mentioned in Japanese Patent Publication No. Kokoku Sho 56[1981]-154381 and Japanese Patent Application Publication No. Kokai Sho 56[1981]-90845,

Polyalkylene glycols and polyalkylene glycol monoethers mentioned in Japanese Patent Publication No. Kokoku Sho 51[1976]-40484 and Japanese Patent Application Publication No. Kokai Sho 51[1976]-137506, Sho 54[1979]-12909, Sho 51[1976]-145638,

Carbonic acid esters mentioned in Japanese Patent Publication No. Kokoku Sho 56[1981]-18628,

Monovalent or divalent alcohols mentioned in Japanese Patent Application Publication No. Kokai Sho 55[1980]-46979 and Sho 51[1976]-129310 such as 2-butyne-1,4-diol, t-butyl alcohol, n-amyl alcohol, etc.,

Dialkylsulfones mentioned in Japanese Patent Application Publication No. Kokai Sho 55[1980]-50072,

Urea, thiourea, and their derivatives mentioned in Japanese Patent Application Publication No. Kokai Sho 56[1981]-8471, Sho 56[1981]-88473, Sho 56[1981]-2363, and Sho 56[1981]-122876,

Dialkyl phosphonate and dialkyl phosphite derivatives mentioned in Japanese Patent Application Publication No. Kokai Sho 55[1980]-120678,

N-vinyl pyrrolidone oligomers mentioned in Japanese Patent Publication No. Kokoku Sho 52[1977]-14643 and Japanese Patent Application Publication No. Kokai Sho 51[1976]-9905,

Hydantoin derivatives mentioned in Japanese Patent Application Publication No. Kokai Sho 56[1981]-109264,  
Cellulose derivatives (e.g., hydroxypropyl cellulose, etc.) and polyvinyl alcohol mentioned in Japanese Patent Application Publication No. Kokai Sho 50[1975]-17840,  
Polyoxyethylene sorbitan fatty acid esters, polyoxyethylene fatty acid esters, and polyoxyethylene alkyl phenyl ethers mentioned in Japanese Patent Application Publication No. Kokai Sho 50[1975]-143602, and  
Water-soluble alginates mentioned in Japanese Patent Application Publication No. Kokai Sho 54[1979]-63005.

The internalization ratio of the humidifying agent to be used for the aqueous recording solution of the present invention differs depending on its type, although it is desirable for its ratio with respect to 100 parts by weight of the recording solution to be confined to a range of 0.2 ~ 30 wt% [sic: Presumably "parts by weight"]. Two or more types of humidifying agents may be used together in the present invention.

In a case where a color image is formed based on the reduction method by using a yellow recording solution, cyan recording solution, and a black recording solution in addition to the magenta recording solution of the present invention, the dyes mentioned in Color Index (published by the American Association of Textile Chemists and Colorists) can be employed as the water-soluble dyes to be used for the respective recording solutions. Water-soluble dyes for yellow recording solutions may, for example, be concretely instantiated by

the dyes mentioned in Japanese Patent Application Publication No. Kokai Sho 54[1979]-89811, Sho 54[1979]-16245, and Sho 49[1974]-89535 as well as direct dyes, acidic dyes, and/or reactive dyes such as C. I. Direct Yellow-27, -28, -33, -39, -58, -86, and -100, C. I. Acid Yellow-17, -19, -25, -29, -38, -49, -59, -61, -72, -111, -114, and -116, C. I. Reactive Yellow-1, -2, -3, -13, -14, -15, and -17, etc. Water-soluble dyes for cyan recording solutions may, for example, be concretely instantiated by the dyes mentioned in Japanese Patent Application Publication No. Kokai Sho 54[1979]-89811, Sho 52[1977]-12008, and Sho 49[1974]-89535 as well as direct dyes, acidic dyes, and/or reactive dyes such as C. I. Direct Blue-1, -8, -71, -76, -78, -80, -86, -90, -106, -108, -123, -163, and -165, C. I. Acid Blue-29, -126, /23 -171, -175, -183, C. I. Reactive Blue-7, -14, -15, -18, -21, and -25, etc.

Water-soluble dyes for black recording solutions may, for example, be concretely instantiated by the dyes mentioned in Japanese Patent Application Publication No. Kokai Sho 50[1975]-15622, Sho 50[1975]-17840, Sho 50[1975]-49004, Sho 51[1976]-5127, Sho 51[1976]-5128, Sho 51[1976]-52004, Sho 51[1976]-137506, Sho 53[1978]-61412, and Sho 53[1978]-77706, and Japanese Patent Publication No. Kokoku Sho 54[1979]-16243 as well as direct dyes, acidic dyes, and/or reactive dyes such as C. I. Direct Black-19, -58, -71, -74, -75, -112, and -117, C. I. Acid Black-1, -24, -26, -48, -52, -58, -60, -107, -109, -119, -131, and -155, etc.

It is also possible to add an antibacterial agent and/or oxygen absorbent into the aqueous recording solution of the present invention.

Concrete examples of effective antibacterial agents include sodium dehydroacetate mentioned in Japanese Patent Application Publication No. Kokai Sho 52[1977]-12008,

1,2-benzisothiazoline-3-one mentioned in Japanese Patent Application Publication No. Kokai Sho 52[1977]-12009,

6-acetoxy-2,4-dimethyl-m-dioxane mentioned in Japanese Patent Application Publication No. Kokai Sho 52[1977]-12010 and Sho 52[1977]-96105,

Formalin and pentachlorophenol sodium shown in Japanese Patent Application Publication No. Kokai Sho 50[1975]-15622,

Sodium benzoate mentioned in Japanese Patent Application Publication No. Kokai Sho 51[1976]-30019, and

8-quinolinol citrate mentioned in Japanese Patent Application Publication No. Kokai Sho 53[1978]-133707.

Sulfites (e.g., sodium sulfite, sodium hydrogen sulfite, etc.) mentioned in Japanese Patent Application Publication No. Kokai Sho 52[1977]-74406 and Sho 53[1978]-61412, D-glucose and L-ascorbic acid mentioned in the same Sho 56[1981]-24472, etc. can be employed as acid absorbents.

Surface tension adjustment agents, furthermore, are instantiated by anionic surfactants (e.g., alkyl sulfuric acid ester sodium, sodium alkylbenzenesulfonates, etc.), cationic surfactants (e.g.,

alkylpyridium sulfates, etc.), nonionic surfactants (e.g., polyoxyethylene alkyl ether, etc.), and/or amphoteric surfactants. Printing objects to which the ink of the present invention can be applied include papers, cloths, film bases, etc. There are no special restrictions on the papers, and papers which are being generally used for ink jet printers can be used, although so-called "coated papers," which are obtained by coating clay layers, gelatin layers, etc. on papers, are especially desirable. References to such coated papers can, for example, be found in Japanese Patent Application Publication No. Kokai Sho 55[1980]-14472 and Sho 55[1980]-146786.

(Application examples)

In the following, the present invention will be concretely explained with reference to application examples. Incidentally, the expression "parts" signifies "parts by weight."

Oily recording solution format

Application Example 1

A coating solution constituted by 43 parts (weight ratio based on the solid content, same below) of fine hollow particles of a styrene-acrylic acid ester copolymer (particle size: 0.3 ~ 0.4  $\mu$ ), 17 parts of anhydrous silica obtained by the vapor phase method (particle size: 12  $\mu$ ), 12 parts of a styrene-butadiene copolymer latex, 18 parts of a polyvinyl acetate latex, and 10 parts of fine polymethyl

methacrylate particles (particle size: Approximately 8  $\mu\text{m}$ ) was coated on a yet-to-be-coated commercial raw paper (unit weight: 64 g/m<sup>2</sup>) by using a wire bar at a solid coating rate of 10 g/m<sup>2</sup>, as a result of which the ink jet recording paper 1 was obtained.

An ink solution constituted by the components shown below was recorded on this recording paper based on the ink jet recording format at a dot density of 8 dots/mm by using an electrostatic acceleration-type ink jet device equipped with a head with a nozzle diameter of 50  $\mu$ .

Ink solution A: Dye (4) of the present invention: 6 parts by weight; diethyl phthalate: 30 parts by weight; diisopropyl adipate: 44 parts by weight; N,N-diethyldodecaneamide: 20 parts by weight.

The specific resistivity of this ink solution was  $3.6 \times 10^7 \Omega\cdot\text{cm}$  (25°C), whereas its viscosity was 7.1 cP (25°C). The extrudability of this ink solution was favorable, and a sharp magenta image of a /24 high density was obtained.

Neither image blots nor flows were observed even after the paper which had been printed with this ink had been immersed in water over a 10-min. period.

#### Application Example 2

Ink solutions B through E [sic: Presumably "B through D"] characterized by the respective compositions shown below were prepared.

Ink solution B: Dye (11) of the present invention: 6 parts by weight; compound (A-3) of the present invention: 4 parts by weight; dibutyl

adipate: 70 parts by weight; benzyl alcohol: 20 parts by weight;  
Ink solution C: Dye (13) of the present invention: 6 parts by weight; compound (A-7) of the present invention: 6 parts by weight; dibutyl maleate: 61 parts by weight; diethyl phthalate: 22 parts by weight; N-methylpyrrolidone: 5 parts by weight;

Ink solution D: Dye (20) of the present invention: 6 parts by weight; compound (A-18) of the present invention: 3 parts by weight; diethyl adipate: 41 parts by weight; diethyl phthalate: 30 parts by weight; dipropylene glycol monomethyl ether: 20 parts by weight.

Each of these ink solutions was printed on an ink jet recording paper according to procedures identical to those in Application Example 1. Favorable extrudabilities were each exhibited by the ink solutions B through D, and sharp magenta images were obtained in each case. The density loss of a case where each of these images was left unattended over a 3-month period under indoor light was 1% or less. Neither image blots nor flows were observed even after the paper which had been printed with each of these inks had been immersed in water over a 10-min. period.

### Application Example 3

A coating solution constituted by 50 parts (solid content weight ratio, same below) of fine polystyrene particles (PLASTIC PIGMENT 722, manufactured by Dow Chemical Co.), 15 parts of silica obtained by the wet method (average particle size: 2.7  $\mu$ ), 10 parts of fine polymethyl methacrylate particles (particle size: 8  $\mu$ ), and 25 parts of polyvinyl acetate latex was coated on a raw paper identical to

that employed in Application Example 1 at a solid coating rate of 10 g/m<sup>2</sup> by using a wire bar, as a result of which the ink jet recording paper 2 was obtained.

An ink solution which had been prepared by using the components shown below was recorded on this recording paper based on the ink jet recording format:

Ink solution E: Dye (30) of the present invention: 6 parts by weight; dibutyl maleate: 54 parts by weight; diethyl phthalate: 25 parts by weight; benzyl alcohol: 15 parts by weight.

The specific resistivity of this ink solution was 3.2 × 10<sup>7</sup> Ω·cm (25°C), whereas its viscosity was 7.4 cP (25°C).

The extrudability of this ink solution was favorable, and a sharp magenta image with a high density was obtained. The density loss of a case where this image had been left unattended over a 3-month period was 1% or less.

#### Application Example 4

An ink jet recording paper on which a coating layer which included as major components fine silicon oxide particles and polyvinyl alcohol at a weight ratio of 75 : 25 had been configured was printed according to procedures identical to those in Application Example 1. An ink solution characterized by the following composition, however, was used:

Ink solution F: Dye (31) of the present invention: 6 parts by weight; diethyl phthalate: 30 parts by weight; isopropyl adipate: 44 parts by weight; N,N-diethyldodecaneamide: 20 parts by weight.

The specific resistivity of this ink solution was  $3.7 \times 10^7 \Omega\text{-cm}$  ( $25^\circ\text{C}$ ), whereas its viscosity was 7.2 cP ( $25^\circ\text{C}$ ). The extrudability of this ink solution was favorable, and a sharp magenta image with a high density was obtained. The density loss of a case where this image had been left unattended over a 3-month period was 3% or less.

#### Application Example 5

Ink solutions G through I characterized by the respective compositions shown below were prepared:

Ink solution G: Oil-soluble cyan dye (see below): 5 parts by weight; diethyl phthalate: 30 parts by weight; diisopropyl adipate: 45 /25 parts by weight; N,N-diethyldodecaneamide: 20 parts by weight.

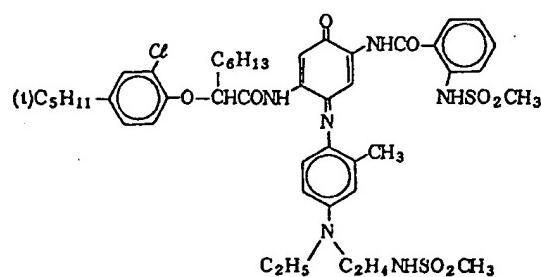
Ink solution H: Oil-soluble yellow dye (see below): 5 parts by weight; diethyl phthalate: 28 parts by weight; diisopropyl adipate: 45 parts by weight; N,N-diethyldodecaneamide: 22 parts by weight.

Ink solution I: Oil-soluble black dye (see below): 6 parts by weight; diethyl phthalate: 32 parts by weight; diisopropyl adipate: 45 parts by weight; N,N-diethyldodecaneamide: 17 parts by weight.

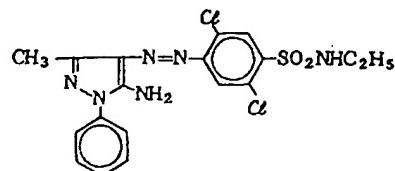
Each of these ink solutions was set within an electrostatic acceleration-type ink jet device identical to that employed in Application Example 1 together with the ink solution of Application Example 1, and ink jet recording papers were then printed. Sharp cyan, yellow, and magenta images were formed on segments on which the ink solutions G and H and the ink solution of Application Example 1 had been independently printed, whereas sharp green, red, and blue images were formed on segments on which two types of inks had been

evenly laminated. The color reproductions of their intermediate colors, furthermore, were also satisfactory. A black image of a high density was formed on the segment on which the ink solution I had been printed alone, whereas a color image with a favorable "black trim" was formed on the segments on which this ink solution and the aforementioned ink solutions had been laminated.

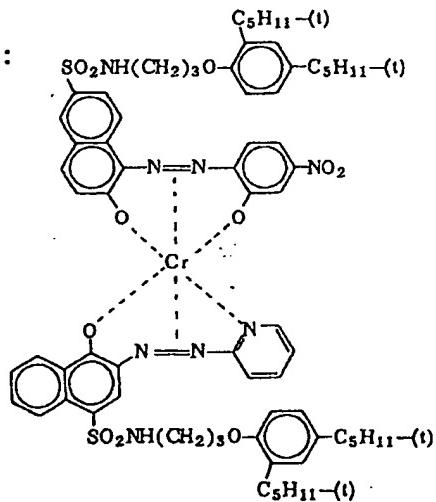
Oil-soluble cyan dye:



Oil-soluble yellow dye:



Oil-soluble black dye:



## Aqueous recording solution method

### Application Example 6

After LBKP (bleached broadleaf kraft pulp) had been beaten at a water filtration degree of CSP 430 cc, 5 parts of talc, 1 parts of saponified rosin, and 2 parts of a sulfuric acid band were added to it, and a raw paper with a unit weight of 100 g/m<sup>2</sup> was formed from it by using a long net papermaking machine. Starch oxide was coated on it at a solid content coating rate of 2 g/m<sup>2</sup> by using a size press during the papermaking process.

A coating solution with a solid content of 30% constituted by 70 parts of synthetic zeolite, 30 parts of synthetic aluminum silicate, 0.3 parts of sodium hexametaphosphate, 10 parts of casein, 10 parts of a styrene-butadiene copolymer latex, 1 part of a melamine resin, and 2 parts of polyethylene glycol was prepared.

The obtained coating solution was coated on the aforementioned raw paper at a solid content coating rate of 10 g/m<sup>2</sup> (single plane) by using an air knife coater, and after the coated paper had been dried, it was transmitted through a supercalender, as a result of which a recording paper was obtained.

A solution constituted by the respective components shown below was printed on this recording paper at a dot density of 8 dots/mm by using an on-demand ink jet recording device on which a head with a nozzle hole diameter of 50 µ had been installed:

Ink solution J: Dye (54) of the present invention: 1.8 parts; N-methyl-2-pyrrolidone: 15.0 parts; diethylene glycol: 2.0 parts;

triethanolamine: 2.0 parts; water: 79.2 parts.

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After the mixture prepared above had been agitated over a 1-hour period while being heated at 30 ~ 40°C, it was compressively filtered (3 kg/cm<sup>2</sup>) through Microfilter FM Type (manufactured by Fuji Photo Film Co.) with an average pore diameter of 0.8 μmm and a diameter of 47 mm, the objective inks were obtained.

Ink solutions K through N of the present invention were likewise obtained by using the respective mixtures shown below:

Ink solution K: Dye (56) of the present invention: 1.8 parts; thiodiglycol: 15.0 parts; diethylene glycol monoethyl ether: 2.0 parts; triethanolamine: 2.2 parts; water: 79.0 parts;

Ink solution L: Dye (58) of the present invention: 2.0 parts; 1,3-dimethoxymethyl-2-imidazolidinone: 15.0 parts; thiodiglycol: 5.0 parts; diethylene glycol: 2.0 parts; triethanolamine: 1.0 parts; water: 75.0 parts;

Ink solution M: Dye (59) of the present invention: 2.0 parts; N-methyl-2-pyrrolidone: 10.0 parts; sulfolane: 5.0 parts; triethanolamine: 1.0 parts; water: 82.0 parts;

Ink solution N: Dye (55) of the present invention: 2.0 parts; N-methyl-2-pyrrolidone: 10.0 parts; N-hydroxyethyl lactamide: 5.0 parts; nonionic surfactant  $(n-C_9H_{19}-\text{C}_6H_4-\text{O}-(\text{CH}_2\text{CH}_2\text{O})_x\text{H})$

z is approximately 10): 0.1 part; triethanolamine: 1.0 part; water: 81.9 parts.

The extrudabilities of all the ink solutions were favorable, and sharp magenta images of high densities were obtained respectively from them.

Patent Applicant: Fuji Photo Film Co., Ltd.

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S.T.I.C. Translations Branch

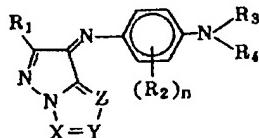
## 明細書

1. 発明の名称 インクジェット記録方法

2. 特許請求の範囲

(1) 記録液を液滴状に噴射して受像材料上に画像を記録するインクジェット記録方法において、下記記録液が一般式(I)で表わされる色素を含むことを特徴とするインクジェット記録方法。

一般式(I)



式中、R<sub>1</sub>、R<sub>2</sub>は水素原子、ハロゲン原子、アルキル基、シクロアルキル基、アルコキシ基、アリール基、アリールオキシ基、アラルキル基、シアノ基、アシルアミノ基、スルホニルアミノ基、ウレイド基、アルキルチオ基、アリールチオ基、アルコキシカルボニル基、カルバモイル基、スルフアモイル基、スルホニル基、アシル基、アミノ

基を表わし、R<sub>3</sub>、R<sub>4</sub>は水素原子、アルキル基、シクロアルキル基、アラルキル基、アリール基を表わす。R<sub>3</sub>とR<sub>4</sub>は互いに結合して環を形成してもよく、また、R<sub>2</sub>とR<sub>3</sub>あるいはR<sub>2</sub>とR<sub>4</sub>が結合して環を形成してもよい。nは0～3の整数を表わす。X、YおよびZは

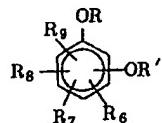
R<sub>5</sub>  
—C—または窒素原子を表わす (R<sub>5</sub>は水素原子、アルキル基、シクロアルキル基、アラルキル基、アリール基、アルコキシ基、アリールオキシ基、アミノ基を表わす)。

R<sub>5</sub>  
またXとYが—C—の時あるいはYとZが—C—の時、互いに結合して飽和ないし不飽和炭素環を形成してもよい。

(2) 画像中に下記一般式(II)で表わされる化合物を共存させることを特徴とする請求項(I)記載のインクジェット記録方法。



## 一般式(Ⅱ)



式中、RおよびR'は水素原子、アルキル基、アシル基、又はスルホニル基を表わし、R<sub>6</sub>、R<sub>7</sub>、R<sub>8</sub>およびR<sub>9</sub>はそれぞれ、水素原子、アルキル基、アリール基、アルコキシ基、アルキルチオ基、アシルアミノ基、水酸基またはハロゲン原子を表わす。ORとOR'のうち少なくとも一つは、これらのオルト位にあるR<sub>5</sub>～R<sub>8</sub>のいずれかと互いに結合して、5員もしくは6員環を形成してもよく、またR<sub>5</sub>～R<sub>8</sub>のうち互いにオルト位の関係にある少なくとも一組が互いに結合して5員もしくは6員環を形成してもよい。

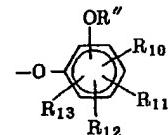
(3) 一般式(Ⅰ)で表わされる色素がスルホ基を有さず、記録液の溶媒が主として有機溶剤であることを特徴とする請求項(1)記載のインクジェット記録方法。

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(4) 一般式(Ⅰ)で表わされる色素が少なくともスルホ基を1個有し、記録液の溶媒が主として水であることを特徴とする請求項(1)記載のインクジェット記録方法。

(5) 一般式(Ⅰ)で表わされる色素が下記一般式(Ⅲ)で表わされる基を有することを特徴とする請求項(1)記載のインクジェット記録方法。

## (Ⅲ)



式中R''はアルキル基を表わし、R<sub>10</sub>、R<sub>11</sub>、R<sub>12</sub>およびR<sub>13</sub>はそれぞれ、水素原子、アルキル基、アリール基、アルコキシ基、アルキルチオ基、アシルアミノ基、水酸基またはハロゲン原子を表わす。OR''とオルト位にあるR<sub>9</sub>～R<sub>12</sub>のいずれかと互いに結合して5員もしくは6員環を形成してもよく、またR<sub>9</sub>～R<sub>12</sub>のうち互いにオルト位の関係にある少なくとも一組が結合して

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5員もしくは6員環を形成してもよい。

## 3. 発明の詳細な説明

## (産業上の利用分野)

本発明はインクジェット記録方法に関し、特に色相の優れた画像を形成するインクジェット記録方法に関する。

## (従来の技術)

インクジェットによる記録は、材料費が安価であること、高速記録が可能であること、記録時の騒音が少ないとこと、カラー記録が容易であることなどの特徴を有し、今後の発展が期待されている記録法である。

現在インクジェット用インクとして、高沸点の有機溶剤を使用した油性インクを用いる方式と、水と水混和性有機溶剤を使用した水性インクを用いる方式がある。いずれの方式でも、使用される色素は、溶剤に対する溶解性が高いこと、色相が優れていること、光や熱に安定であること、人体に対する毒性が低いこと、純度が高く安価に入手できることなどの要件を兼ね備えている必要が

ある。これらの要件を満たす色素を選択することは相当な困難を伴なうが、特に満足できるマゼンタ色相を有する色素はこれまでに見いだされていなかつた。

## (本発明が解決しようとする課題)

本発明の目的は前記従来の欠点を解決することにあり、特に良好な色相を有するマゼンタ色相を含む画像を形成するのに適したインクジェット記録法を得ることにある。

## (課題を解決するための手段)

下記一般式(Ⅰ)で表わされる色素を含むインクジェット用記録液により記録を行なうことにより前記の欠点が解決されることが判明し、本発明を成し遂げた。

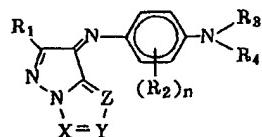
即ち、本発明は以下の通りである。

(1) 記録液を液滴状に噴射して画像を記録するインクジェット記録方法において、下記記録液が一般式(Ⅰ)で表わされる色素を含むことを特徴とするインクジェット記録方法。

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## 一般式(I)



式中、R<sub>1</sub>、R<sub>2</sub>は水素原子、ハロゲン原子、アルキル基、シクロアルキル基、アルコキシ基、アリール基、アリールオキシ基、アラルキル基、シアノ基、アシルアミノ基、スルホニルアミノ基、ウレイド基、アルキルチオ基、アリールチオ基、アルコキシカルボニル基、カルバモイル基、スルフアモイル基、スルホニル基、アシル基、アミノ基を表わし、R<sub>3</sub>、R<sub>4</sub>は水素原子、アルキル基、シクロアルキル基、アラルキル基、アリール基を表わす。R<sub>3</sub>とR<sub>4</sub>は互いに結合して環を形成してもよく、また、R<sub>2</sub>とR<sub>3</sub>あるいはR<sub>2</sub>とR<sub>4</sub>が結合して環を形成してもよい。nは0～3の整数を表わす。X、YおよびZは-C—または空素

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R<sub>7</sub>、R<sub>8</sub>およびR<sub>9</sub>はそれぞれ、水素原子、アルキル基、アリール基、アルコキシ基、アルキルチオ基、アシルアミノ基、水酸基またはハロゲン原子を表わす。ORとOR'のうち少なくとも一つは、これらのオルト位にあるR<sub>5</sub>～R<sub>8</sub>のいずれかと互いに結合して5員もしくは6員環を形成してもよく、またR<sub>5</sub>～R<sub>8</sub>のうち互いにオルト位の関係にある少なくとも一組が互いに結合して5員もしくは6員環を形成してもよい。

(3) 一般式(I)で表わされる色素がスルホ基を有さず、記録液の溶媒が主として有機溶剤であることを特徴とする前記(i)記載のインクジェット記録方法。

(4) 一般式(I)で表わされる色素が少なくともスルホ基を1個有し、記録液の溶媒が主として水であることを特徴とする前記(i)記載のインクジェット記録方法。

(5) 一般式(I)で表わされる色素が下記一般式(II)で表わされる基を有することを特徴とする前記(i)記載のインクジェット記録方法。

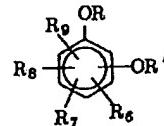
原子を表わす(R<sub>5</sub>は水素原子、アルキル基、シクロアルキル基、アラルキル基、アリール基、アルコキシ基、アリールオキシ基、アミノ基を表わす)。

$\begin{array}{c} R_5 \\ | \\ \text{---C---} \\ | \\ \text{X---Y} \end{array}$  または  $\begin{array}{c} R_5 \\ | \\ \text{---C---} \\ | \\ Z \end{array}$  の時、互いに結合して飽和ないし不飽和炭素環を形成してもよい。

上記の各置換基はさらに他の置換基で置換されてもよい。

(2) 画像中に下記一般式(II)で表わされる化合物を共存させることを特徴とする前記(ii)記載のインクジェット記録方法。(

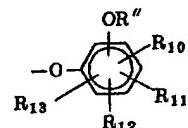
## 一般式(II)



式中、RおよびR'は水素原子、アルキル基、アシル基、又はスルホニル基を表わし、R<sub>6</sub>、

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## (III)



式中R''はアルキル基を表わし、R<sub>10</sub>、R<sub>11</sub>、R<sub>12</sub>、およびR<sub>13</sub>はそれぞれ、水素原子、アルキル基、アリール基、アルコキシ基、アルキルチオ基、アシルアミノ基、水酸基またはハロゲン原子を表わす。OR''とオルト位にあるR<sub>9</sub>～R<sub>12</sub>のいずれかと互いに結合して5員もしくは6員環を形成してもよく、またR<sub>9</sub>～R<sub>12</sub>のうち互いにオルト位の関係にある少なくとも一組が結合して5員もしくは6員環を形成してもよい。

以下に一般式(I)について詳しく説明する。

R<sub>1</sub>、R<sub>2</sub>は水素原子、ハロゲン原子(塩素原子、臭素原子等)、アルキル基(炭素数1～12のアルキル基、例えばメチル基、エチル基、ブチル基、イソプロピル基、1-ブチル基、ヒドロキシエチル基、メトキシエチル基、シアノエチル基、

- 10 -

トリフルオロメチル基等)、シクロアルキル基(例えばシクロペンチル基、シクロヘキシル基等)、アルコキシ基(炭素数1～12のアルコキシ基、例えばメトキシ基、エトキシ基、イソプロポキシ基、メトキシエトキシ基、ヒドロキシエトキシ基等)、アリール基(例えばフェニル基、p-トリル基、p-メトキシフェニル基、p-クロロフェニル基、o-メトキシフェニル基、m-スルホプロピルアミノフェニル基、等)、アリールオキシ基(例えばフェノキシ基、p-メチルフェノキシ基、p-メトキシフェニル基、o-メトキシフェノキシ基等)、アラルキル基(ベンジル基、2-フェネチル基等)、シアノ基、アシルアミノ基(アセチルアミノ基、プロピオニルアミノ基、イソブチロイルアミノ基、ベンゾイルアミノ基、m-スルホプロピルアミノベンゾイルアミノ基、等)、スルホニルアミノ基(メタンスルホニルアミノ基、ベンゼンスルホニルアミノ基、トリフルオロメタニスルホニルアミノ基等)、ウレート基(3-メチルウレート基、3,3-ジメチルウレート基、

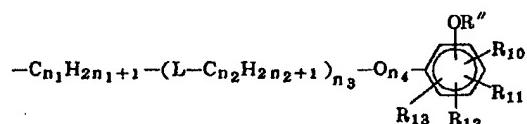
-11-

1,3-ジメチルウレート基等)、アルキルチオ基(メチルチオ基、ブチルチオ基等)、アリールチオ基(フェニルチオ基、p-トリルチオ基等)、アルコキシカルボニル基(メトキシカルボニル基、エトキシカルボニル基等)、カルバモイル基(メチルカルバモイル基、ジメチルカルバモイル基等)、スルフアモイル基(ジメチルスルフアモイル基、ジエチルスルフアモイル基等)、スルホニル基(メタンスルホニル基、ベンゼンスルホニル基、フェニルスルホニル基等)、アシル基(アセチル基、ブチロイル基等)、アミノ基(メチルアミノ基、ジメチルアミノ基等)、を表わす。

これらの中で特に好ましいものは炭素数3以下のアルキル基、炭素数3以下のアルコキシ基、ハロゲン原子、炭素数7以下のアシルアミノ基である。

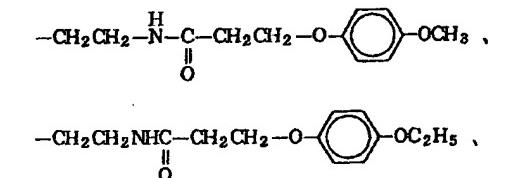
R<sub>3</sub>、R<sub>4</sub>は水素原子、アルキル基[炭素数1～25のアルキル基、例えばメチル基、エチル基、プロピル基、イソプロピル基、t-ブチル基、ヒドロキシエチル基、シアノエチル基、

-12-

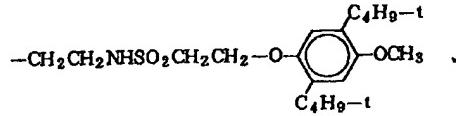
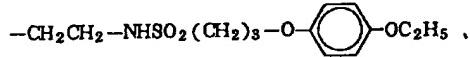
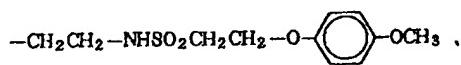
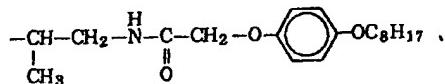
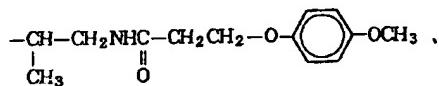
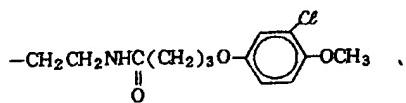
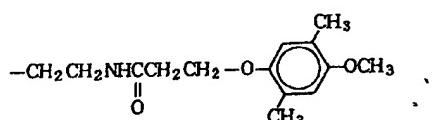


(n<sub>1</sub>、n<sub>2</sub>は1～5の整数を表わし、n<sub>3</sub>、n<sub>4</sub>は0又は1を表わし、Lは-N-C-、-C-N-、-N-SO<sub>2</sub>-、-SO<sub>2</sub>-N-、-OC-、-C-O-、-O-又は-N- (R<sub>14</sub>は水素原子またはアルキル基)を表わし、R''はアルキル基を表わし、R<sub>10</sub>、R<sub>11</sub>、R<sub>12</sub>およびR<sub>13</sub>はそれぞれ水素原子、アルキル基、アリール基、アルコキシ基、アルキルチオ基、アシルアミノ基、水酸基またはハロゲン原子を表わす。-OR''とオルト位にあるR<sub>9</sub>～R<sub>12</sub>のいずれかと互いに結合して5員もしくは6員環を形成してもよく、またR<sub>9</sub>～R<sub>12</sub>のうち互いにオルト位の関係にある少なくとも一組が結合して5員もしくは6員環を形成してもよい。例え

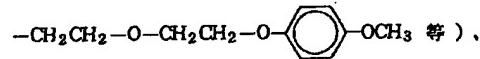
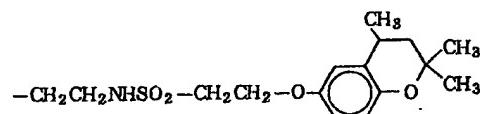
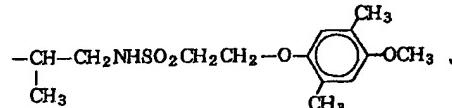
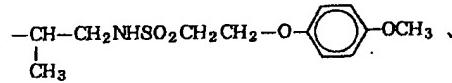
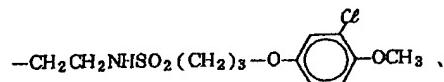
ば4-メトキシフェノキシエチル、4-メトキシフェノキシプロピル、4-エトキシフェノキシエチル、3-メチル-4-メトキシフェノキシエチル、2,5-ジメチル-4-メトキシフェノキシエチル、2,5-ジメトキシフェニルエチル、3-クロロ-4-メトキシフェノキシエチル、



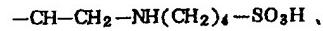
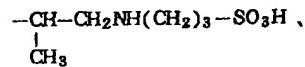
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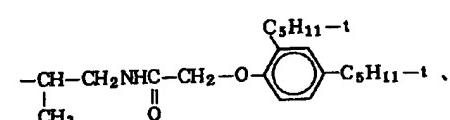
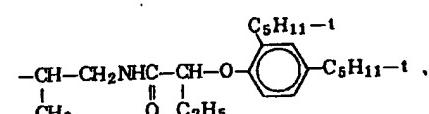
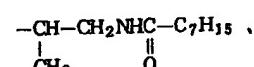
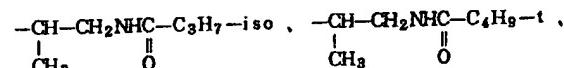
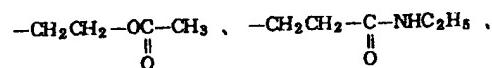
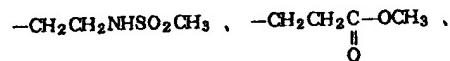
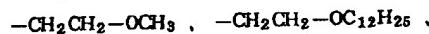
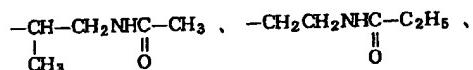


スルホプロピル基、スルホブチル基、

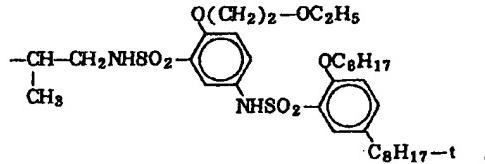
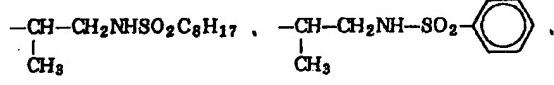
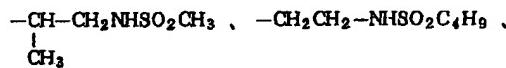
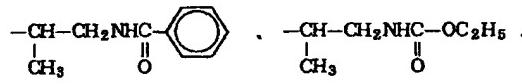
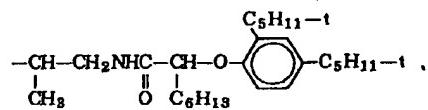
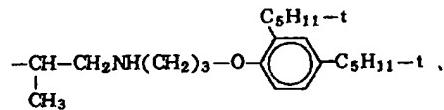


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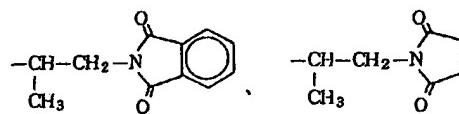
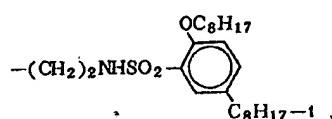
$\text{--C}_{n_1}\text{H}_{2n_1+1}-(\text{L}-\text{C}_{n_2}\text{H}_{2n_2+1})_{n_3}-\text{R}_{15}$  ( $n_1, n_2, n_3$ , Lは前記と同じ。R<sub>15</sub>はアルキル基、アルコキシ基又はアリール基。例えば



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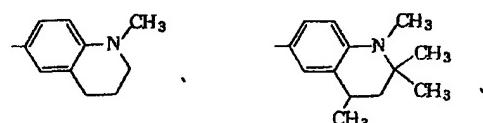


等)、シクロアルキル基(例えばシクロペンチル基、シクロヘキシル基等)、アラルキル基(ベンジル基、 $\mu$ -スルホベンジル基、 $\mu$ -フエニルエチル基等)、アリール基(例えばフェニル基、 $p$ -トルリル基等)を表わす。

これらの中で特に好ましいものは置換もしくは非置換の低級アルキル基である。

またR<sub>3</sub>とR<sub>4</sub>が結合して環を形成するもの

(例えば $-\text{N}(\square)$ 、 $-\text{N}(\text{C}_6\text{H}_5)$ 、 $-\text{N}(\text{C}_6\text{H}_5)\text{O}$ 等)およびR<sub>3</sub>またはR<sub>4</sub>とR<sub>2</sub>が結合して環を形成するもの(例えば



等)も好ましい例として挙げると  
ができる。

X、YおよびZは-C-または窒素原子を表わし、R<sub>5</sub>は水素原子、アルキル基(炭素数1~25のアルキル基、具体的にはR<sub>3</sub>、R<sub>4</sub>に記載のものを挙げることができる。)、シクロアルキル基(例えばシクロペンチル基、シクロヘキシル基等)、アラルキル基(ベンジル基、フェニルエチル基等)、アリール基(例えばフェニル基、 $\beta$ -メチルフェニル基、 $\beta$ -ニトロフェニル基、 $\mu$ -メチルフェニル基等)、アルコキシ基(メトキシ基、エトキシ基等)、アリールオキシ基(フェノキシ基等)、

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アミノ基を表わす。

X、Y、Zの好ましい例としてはX、Y、Zすべてが窒素原子のもの、X、Y、Zのうち2つが窒素原子のもの、X、Y、Zのうち1つのみ窒素原子のものを挙げることができ、特に好ましいものはX、Y、Zすべてが窒素原子のものおよびX、Y、Zのうち2つが窒素原子のものである。

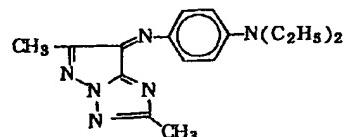
一般式(I)で表わされる色素のうち特に好ましいものは前記一般式(III)で表わされる基を1個又は2個含有する色素である。

油性インクに用いる場合、一般式(I)の色素にはスルホ基を含まないことが好ましく、水性インクに用いる場合、少なくとも1個のスルホ基を含むことが好ましい。

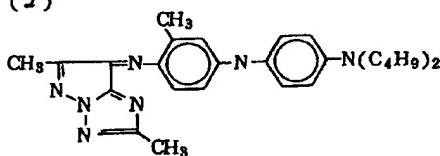
以下に本発明に用いられる一般式(I)で表わされる色素の好ましい具体例を示す。本発明はこれらに限定されるものではない。



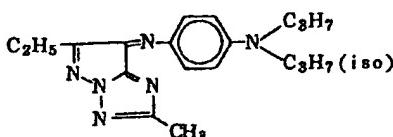
(1)



(2)

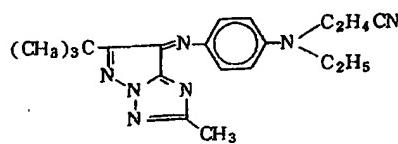


(3)

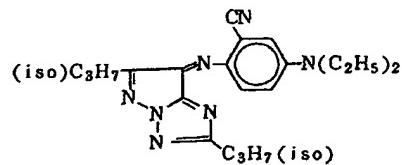


- 22 -

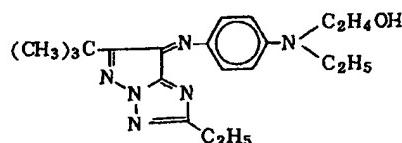
(4)



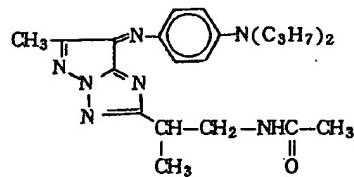
(7)



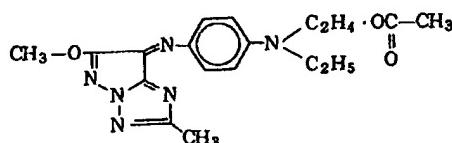
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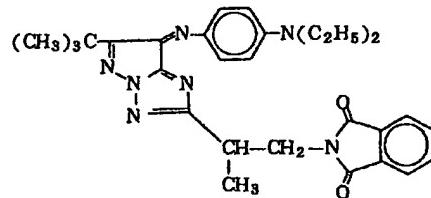
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(6)



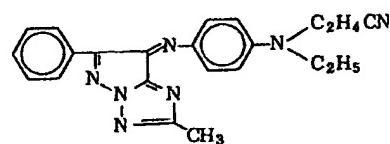
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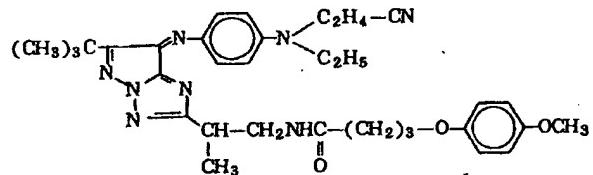
- 2 3 -

- 2 4 -

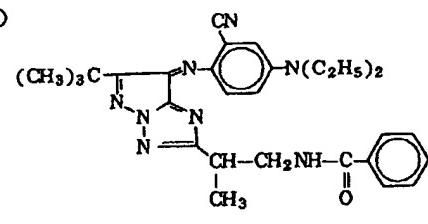
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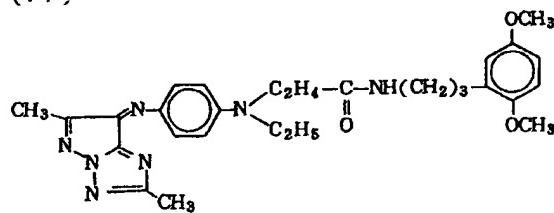
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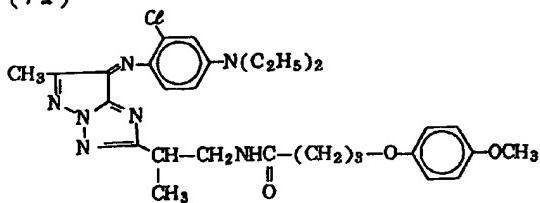
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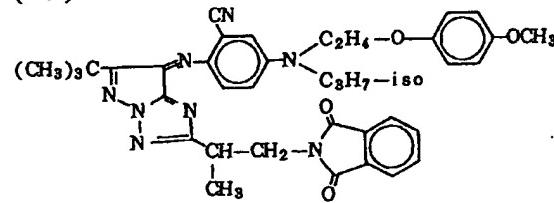
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(12)



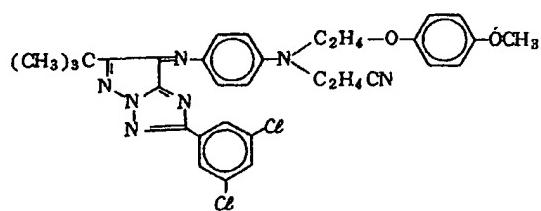
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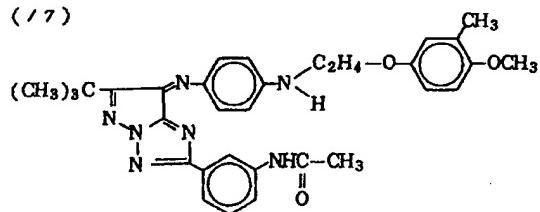
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- 2 6 -

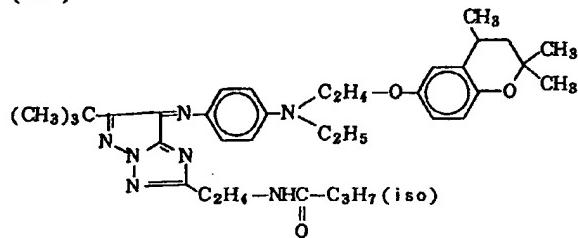
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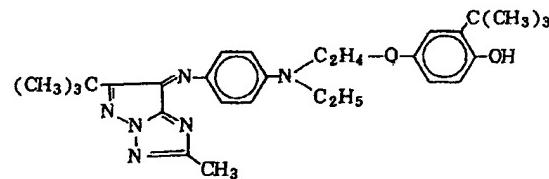


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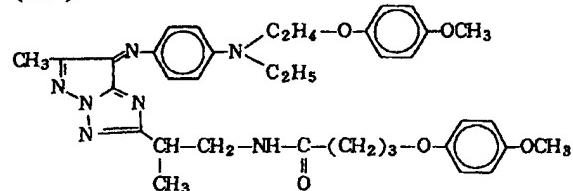


- 27 -

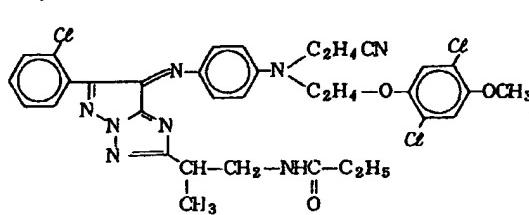
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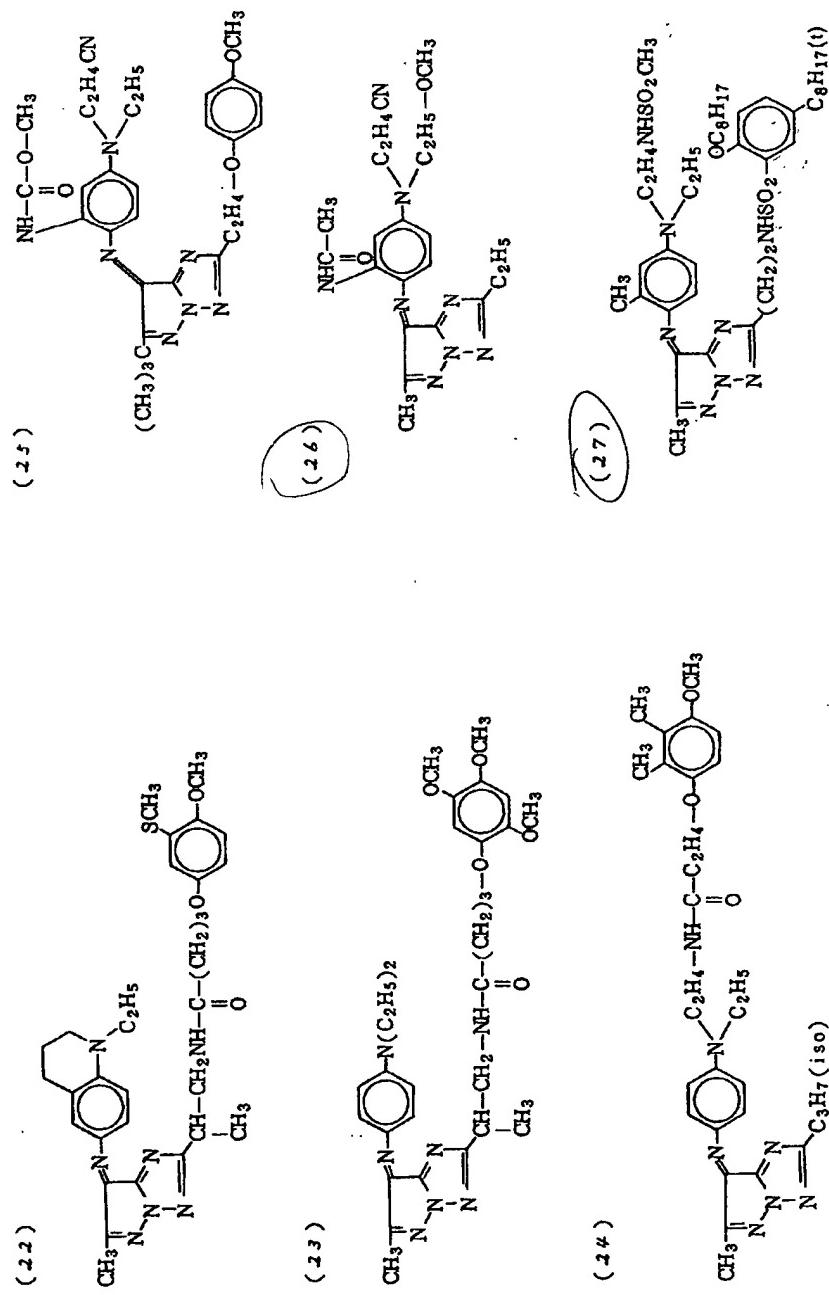
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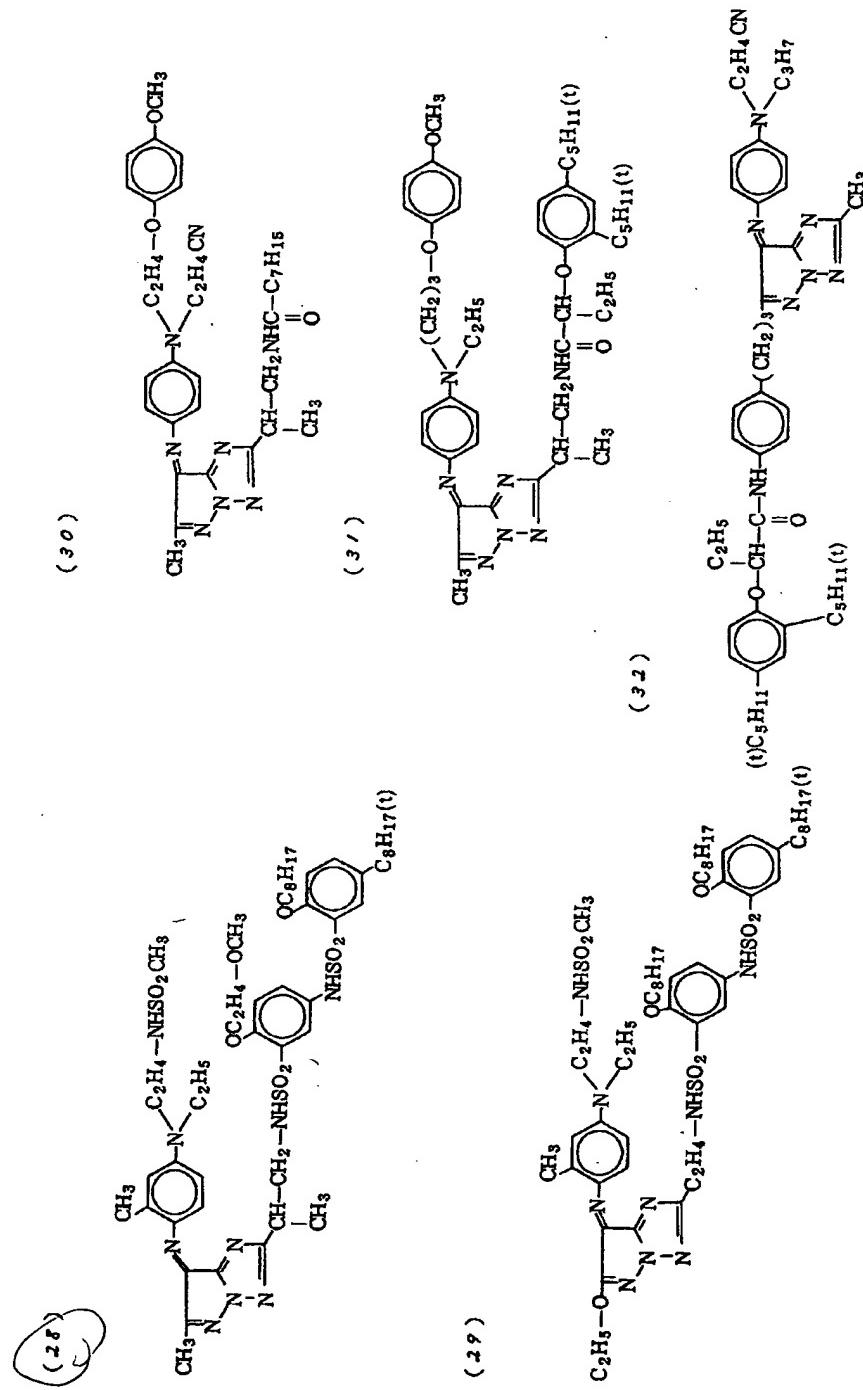


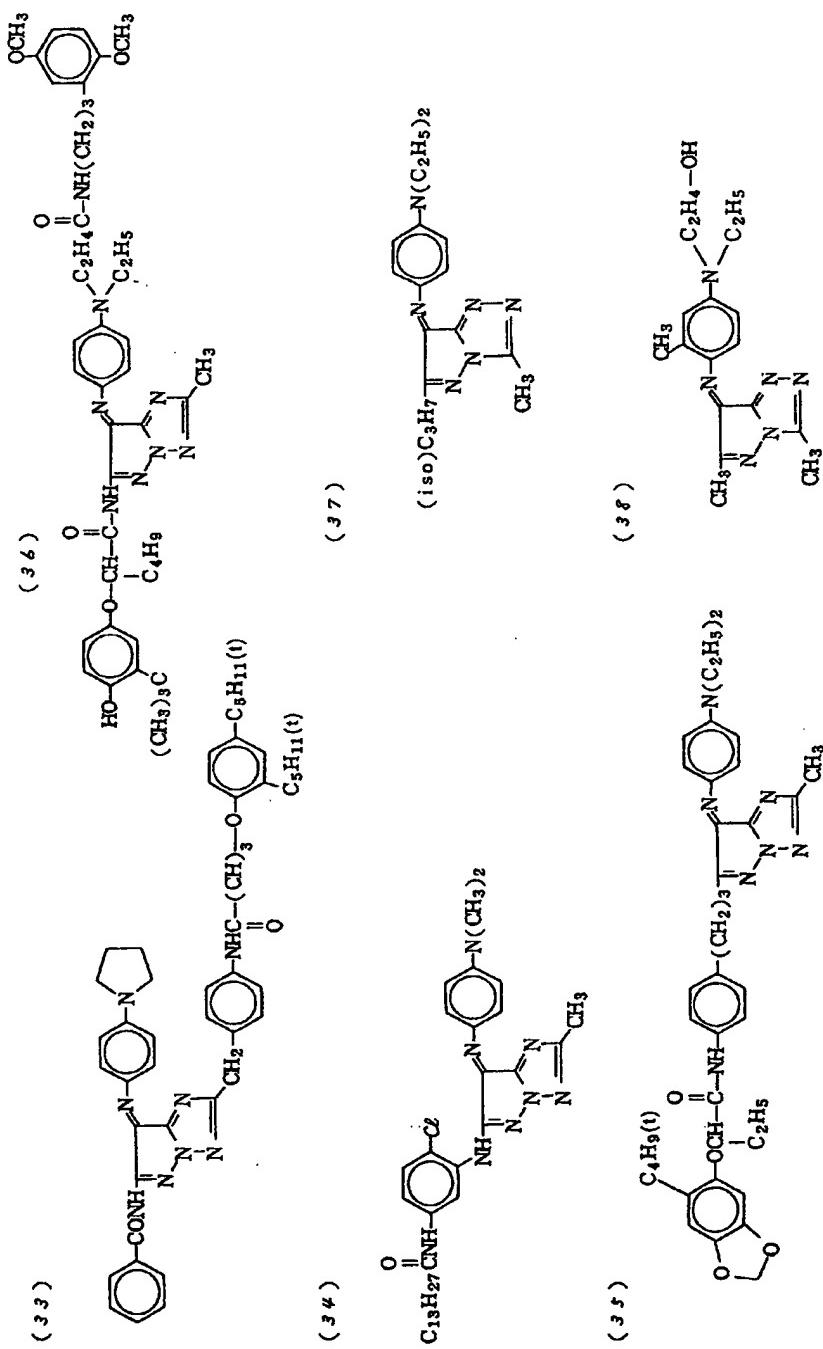
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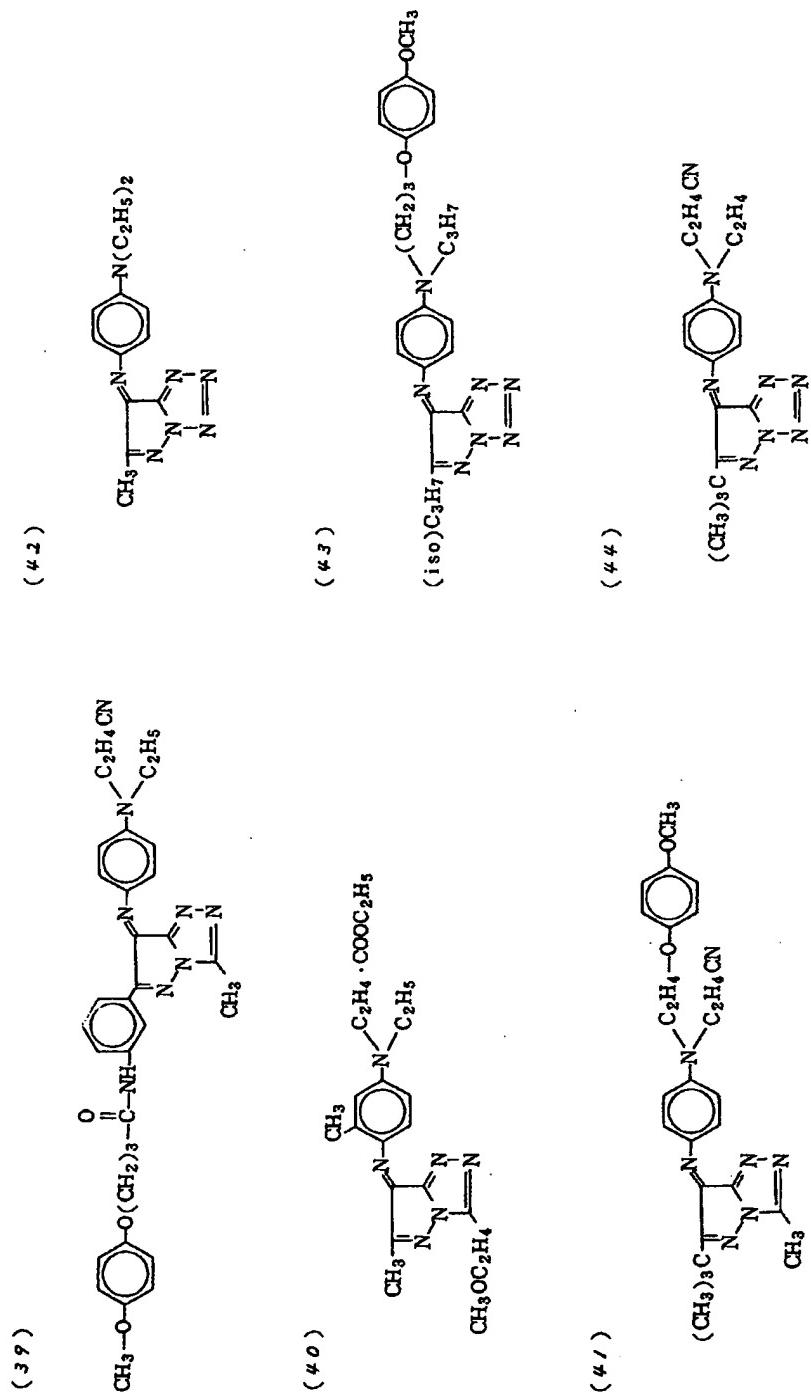
- 28 -



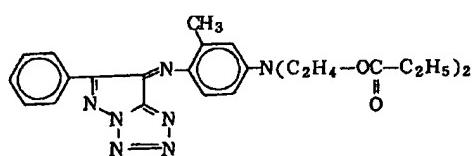




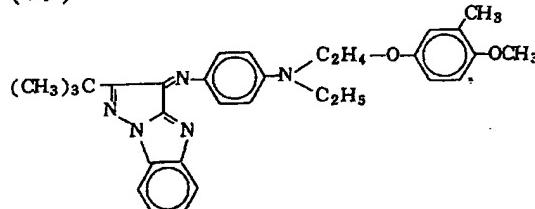
- 3 / -



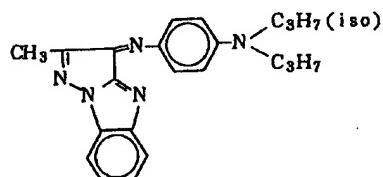
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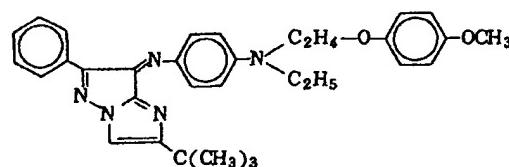
(46)



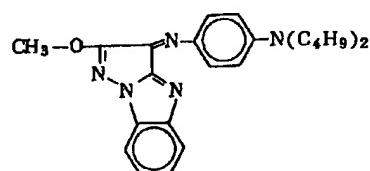
(47)



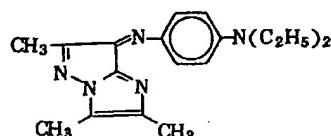
(48)



(49)



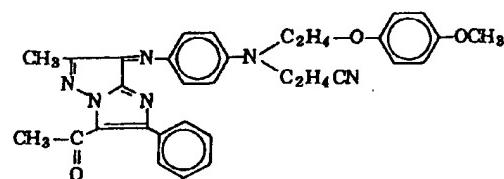
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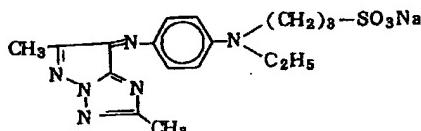
- 3 3 -

- 3 4 -

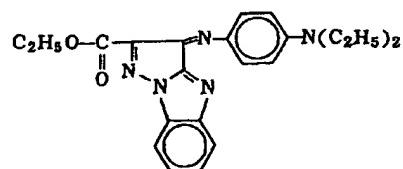
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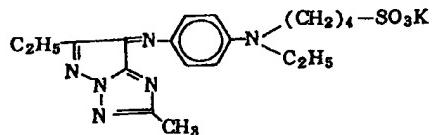
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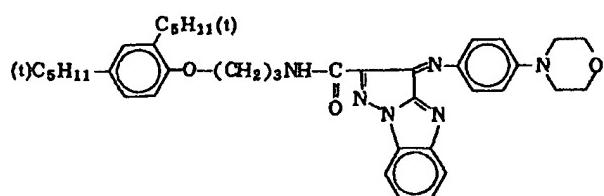
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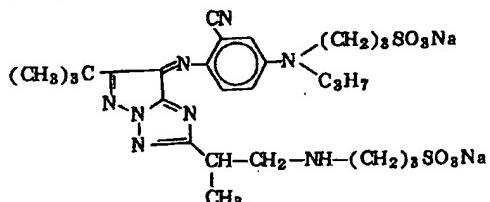
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(55)

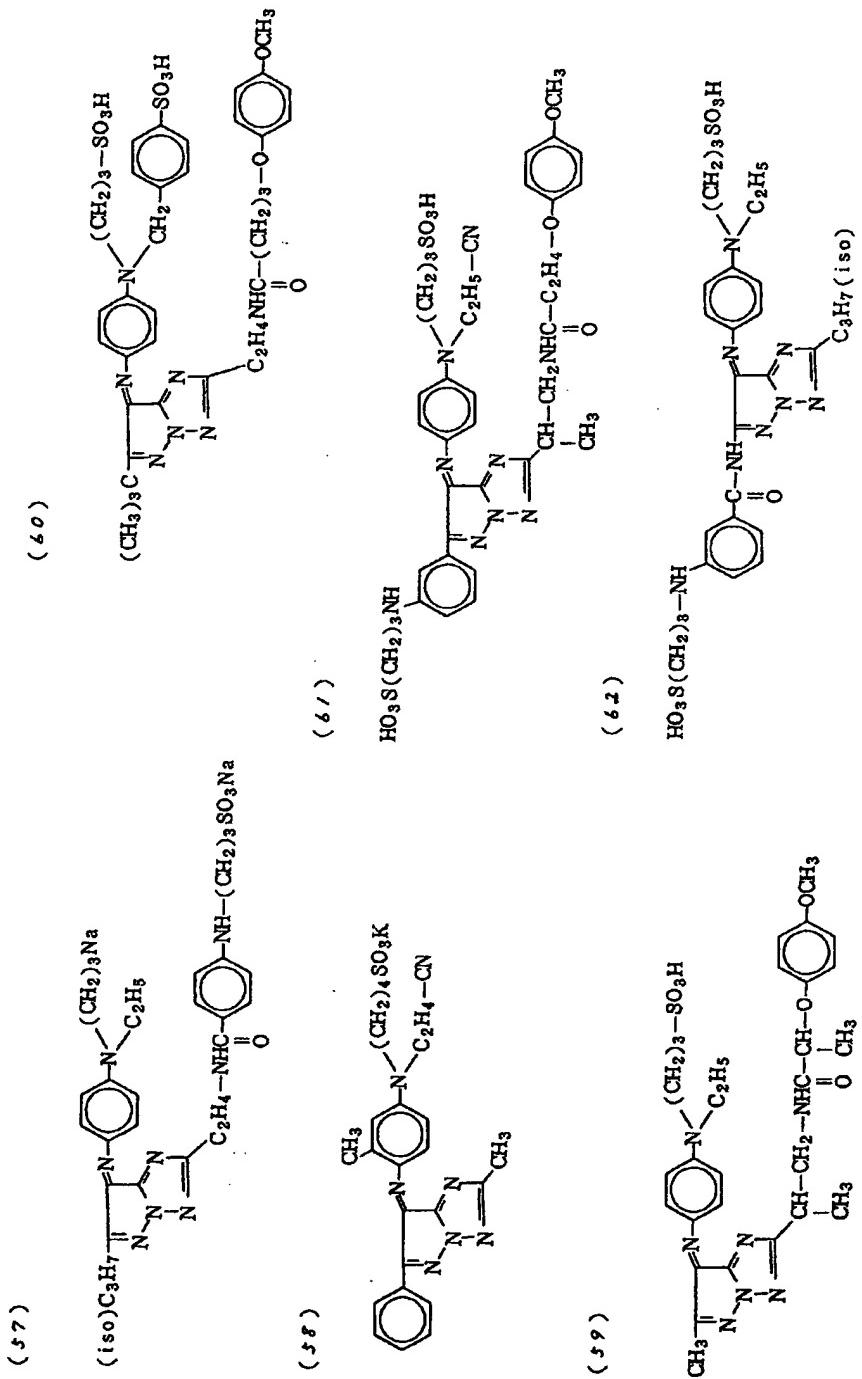


(56)

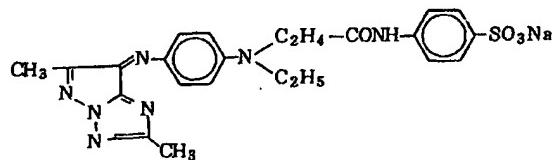


- 3 5 -

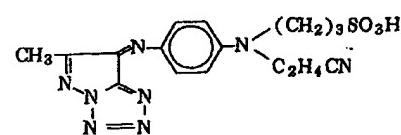
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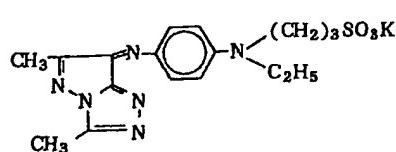
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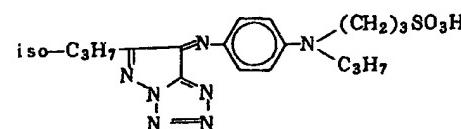
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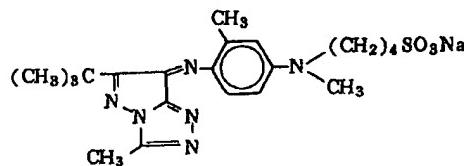
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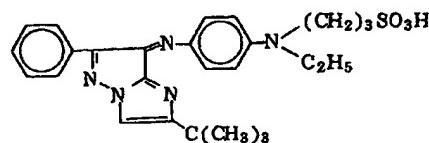
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(65)



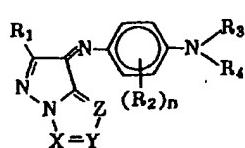
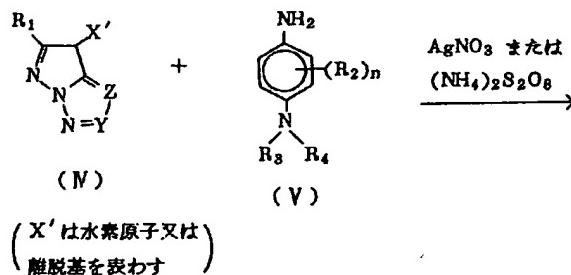
(68)



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一般式(I)で表わされる色素は下記一般式(V)で表わされる縮環ピラゾール誘導体と下記一般式(V)で表わされるp-フェニレンジアミン誘導体との酸化カップリングにより得ることができる。



(I)

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以下に油性の記録液を用いる方式について記す。

本発明に使用される記録液の液媒体は、主として通常の有機溶剤から所望に応じて適宜選択して使用される。具体的には、たとえば、エタノール、ペンタノール、ヘプタノール、オクタノール、シクロヘキサンオール、ベンジルアルコール、フェニルエチルアルコール、フェニルプロピルアルコール、フルフリルアルコール、アニスアルコールなどのアルコール類、エチレングリコールモノエチルエーテル、エチレングリコールモノフェニルエーテル、ジエチレングリコールモノエチルエーテル、ジエチレングリコールモノブチルエーテル、プロピレングリコールモノエチルエーテル、ジプロピレングリコールモノメチルエーテル、ジプロピレングリコールモノエチルエーテル、エチレングリコールジアセテート、エチレングリコールモノメチルエーテルアセテート、ジエチレングリコールモノエチルアセテート、エチレングリコールジアセテート、プロピレングリコールジアセテート

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などのグリコール誘導体、ベンジルメチルケトン、ベンジルアセトン、ジアセトンアルコール、シクロヘキサノンなどのケトン類、ブチルフェニルエーテル、ベンジルエチルエーテル、ヘキシリエーテルなどのエーテル類、酢酸エチル、酢酸アミル、酢酸ベンジル、酢酸エニルエチル、酢酸エノキシエチル、フェニル酢酸エチル、プロピオン酸ベンジル、安息香酸エチル、安息香酸ブチル、ラウリン酸エチル、ラウリン酸ブチル、ミリスチン酸イソプロピル、パルミチン酸イソプロピル、リン酸トリエチル、リン酸トリブチル、フタル酸ジエチル、フタル酸ジブチル、マロン酸ジエチル、マロン酸ジプロピル、ジエチルマロン酸ジエチル、コハク酸ジエチル、コハク酸ジブチル、グルタル酸ジメチル、グルタル酸ジエチル、アジピン酸ジエチル、アジピン酸ジプロピル、アジピン酸ジブチル、アジピン酸ジ(ヌメトキシエチル)、セバシン酸ジエチル、マレイン酸ジエチル、マレイン酸ジブチル、マレイン酸ジオクチル、フマル酸ジエチル、フマル酸ジオクチル、ケイ皮酸3-ヘ

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ては、粘度調整剤、表面張力調整剤、比抵抗調整剤、皮膜形成剤、紫外線吸収剤(好ましい紫外線吸収剤は特開昭60-262159号に記載されているベンゾトリアゾール類である。)、酸化防止剤、退色防止剤などが挙げられる。

次に、一般式(Ⅱ)で表わされる化合物をさらに詳細に述べる。

RおよびR'は水素原子、炭素数1～20の直鎖、分岐鎖もしくは環状のアルキル基(例えばメチル基、エチル基、プロピル基、ロープチル基、i-ブチル基、n-オクチル基、n-ドデシル基、ローヘキサデシル基、シクロヘキシル基など)、炭素数1～20のアシル基(例えばアセチル基、プロピオニル基、オクタノイル基、ベンゾイル基など)、炭素数1～20のスルホニルアミノ基(例えばメチルスルホニル基、プロピルスルホニル基、フェニルスルホニル基など)を表わし、互いに同じでも異なるつてもよい。RおよびR'の中で好ましいものは炭素数1～10のアルキル基である。R<sub>6</sub>、R<sub>7</sub>、R<sub>8</sub>およびR<sub>9</sub>はそれぞれ、

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キセニルなどのエステル類、石油エーテル、石油ベンジル、テトラリン、デリカン、i-アミルベンゼン、ジメチルナフタリンなどの炭化水素系溶剤、アセトニトリル、ホルムアミド、N-N-ジメチルホルムアミド、ジメチルスルホキシド、スルホラン、プロピレンカーボネート、N-メチル-2-ピロリドン、N-エチル-2-ピロリドン、N-ビニル-2-ピロリドン、N,N-ジエチルデカンアミドなどの極性溶媒があげられる。これらの溶剤は単独で使用してもよいし、2種以上を混合して使用してもよい。溶剤としてエステル基を2個含有するものが好ましく、溶剤の沸点は140°C以上のものが特に好ましい。

本発明の一般式(Ⅰ)で表わされる色素は記録液100重量部中に0.2～10重量部含有させることができが好ましい。

本発明に使用される記録液には他のマゼンタ色素が所望に応じて適宜添加されてもよい。

本発明の記録液には、種々の添加剤が所望に応じて適宜添加されてもよい。その様な添加剤とし

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水素原子、炭素数1～20の直鎖、分岐鎖もしくは環状のアルキル基(例えばメチル基、エチル基、i-ブチル基、n-ヘキシル基、n-オクチル基、sec-ドデシル基、n-ヘキサデシル基、シクロヘキシル基など)、炭素数6～20のアリール基(例えばフェニル基、ナフチル基など)、炭素数1～20のアルコキシ基(例えばメトキシ基、エトキシ基、ロープトキシ基、i-ブトキシ基、n-オクチルオキシ基、n-ヘキサデシルオキシ基など)、炭素数1～20のアルキルチオ基(例えばメチルチオ基、n-ブチルチオ基、n-オクチルチオ基など)、炭素数1～20のアシルアミノ基(例えばアセチルアミノ基、プロピオニルアミノ基など)、水酸基、ハロゲン原子(例えばクロル原子、ブロム原子など)を表わし、それぞれ同一でも異なるつてもよい。ORとOR'のうち少なくとも1つはこれらのオルト位にあるR<sub>6</sub>～R<sub>9</sub>のいずれかと互いに結合して5員もしくは6員環(例えばクロマン環、スピロクロマン環、クマラン環など)を形成してもよく、またR<sub>6</sub>～R<sub>9</sub>の

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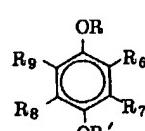
うち互いにオルト位の関係にある少なくとも一組が互いに結合して5員もしくは6員環（例えば脂環、ヘテロ環、芳香環、スピロ環などを含む）を形成してもよい。ここで、R、R'、R<sub>6</sub>、R<sub>7</sub>、R<sub>8</sub>およびR<sub>9</sub>で表わされる基のうち、アルキル、アリールを部分的に含む基はさらに置換基で置換されてもよい。好ましい置換基としてはアルキル基、アリール基、アルコキシ基、アリールオキシ基、アルキルチオ基、アリールチオ基、アシル基、アシルアミノ基、水酸基、ハロゲン原子、シアノ基、アルコキシカルボニル基、カルバモイル基、スルファモイル基、アシルオキシ基、ニトロ基などがある。

一般式(Ⅱ)で表わされる化合物のうち、本発明の効果の点でOR'がORのオルト位、又はパラ位にあるものが好ましく、一般式(Ⅱ-1)、(Ⅱ-2)、(Ⅱ-3)、(Ⅱ-4)または(Ⅱ-5)で表わされる化合物はさらに好ましい。

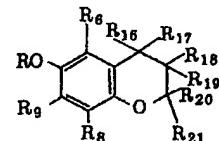


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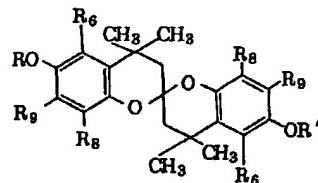
一般式(Ⅱ-1)



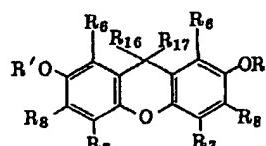
一般式(Ⅱ-2)



一般式(Ⅱ-3)

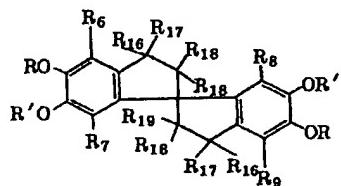


一般式(Ⅱ-4)



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一般式(Ⅱ-5)



一般式(Ⅱ-1)～(Ⅱ-5)で表わされる化合物のR、R'、R<sub>6</sub>、R<sub>7</sub>、R<sub>8</sub>およびR<sub>9</sub>は一般式(Ⅱ)と同じである。R<sub>16</sub>、R<sub>17</sub>、R<sub>18</sub>、R<sub>19</sub>、R<sub>20</sub>およびR<sub>21</sub>は互いに同じでも異なるつてもよく、それぞれ水素原子、アルキル基(炭素数1～20の直鎖、分岐鎖もしくは環状のアルキル基で例えばメチル基、エチル基、ノーブチル基、n-オクチル基、シクロヘキシル基など)、アリール基(炭素数6～20のアリール基で例えばフェニル基、ナフチル基など)、アルコキシ基(炭素数1～20のアルコキシ基で例えばメトキシ基、n-ブトキシ基、n-オクチルオキシ基など)、ヘテロ環基(例えばモルホリニル基)、アルキル

アミノ基(炭素数1～20のアルキルアミノ基で例えばジエチルアミノ基、ジブチルアミノ基、n-オクチルアミノ基など)、アルコキシカルボニル基(炭素数1～20のアルコキシカルボニル基で例えばエトキシカルボニル基、n-ヘキシルオキシカルボニル基)を表わす。

本発明の一般式(Ⅱ)で表わされる化合物は退色防止剤として用いられるが、単独あるいは2種以上併用することもでき、他の公知の退色防止剤を併用することもできる。

公知の退色防止剤としてはハイドロキノン類、フェノール類、クロマノール類、クマラン類、ヒンダードアミン類、錯体などがあり、例えば特開昭59-83162号、同58-24141号、同52-152225号、米国特許3698909号、同4268593号、英国特許2069162(A)号、同2027731号などの明細に記載されている。

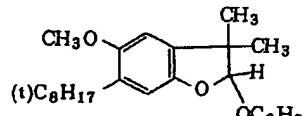
以下に一般式(Ⅱ)で表わされる化合物の具体例を示すが、これに限定されるものではない。

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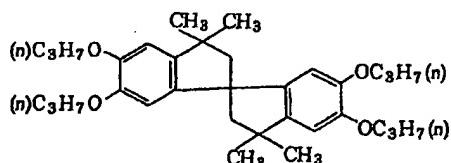
- 49 -



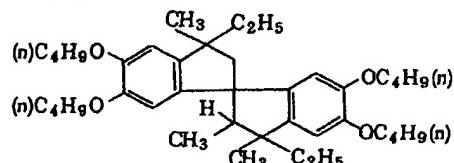
(A-17)



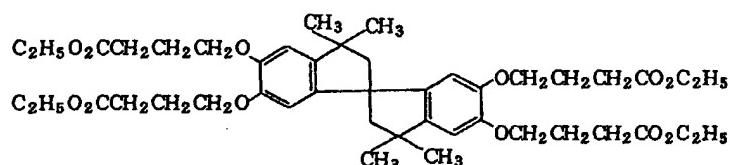
(A-18)



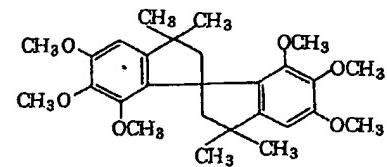
(A-19)



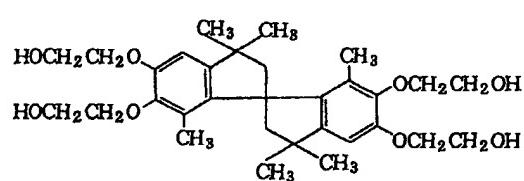
(A-20)



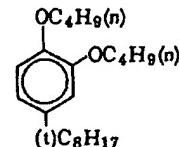
(A-21)



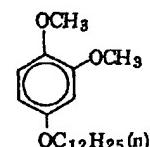
(A-22)



(A-23)

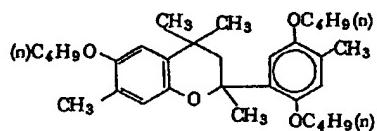


(A-24)



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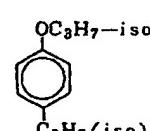
(A-25)



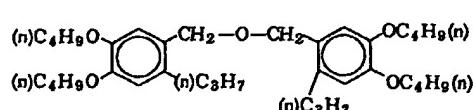
(A-29)



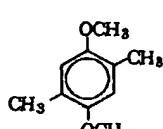
(A-30)



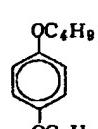
(A-26)



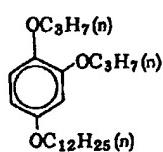
(A-31)



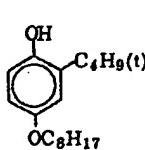
(A-32)



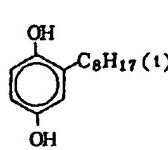
(A-27)



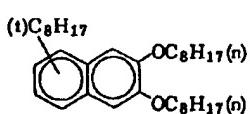
(A-33)



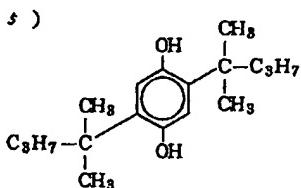
(A-34)



(A-28)



(A-35)



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本発明の一般式(Ⅱ)の化合物は米国特許第4,360,589号、同第4,273,864号、特開昭55-50244号、同53-20327号、同53-77526号、同59-10539号、特公昭57-37856号等に記載されている方法で、もしくはその方法に準じて容易に合成することができる。

本発明の一般式(Ⅱ)の化合物は、本発明の記録液に含有させてよいし、別のノズルから液滴状に噴射してもよい。また画像を記録する受像材料中に含有してもよい。要するに本発明の一般式(Ⅰ)で表わされる色素と画像中に共存させればよい。色素に対して0.5~200重量%、好ましくは2~150重量%の範囲で共存できるように使用することができる。

フルカラー画像を形成するために、本発明のマゼンタ色調記録液は、シアン色調およびイエロー色調記録液と共に用いることができる。また、色調を整えるためさらにブラック色調記録液と共に用いることもできる。これら記録液に使用される

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載のアゾ色素。

ブラック色素：特開昭64-16880号に記載の金属キレート色素。

本発明に使用される記録液は、溶媒体成分あるいは各種添加剤が適宜加えられ、所望の物性値に調合されることによつて、種々のインクジェット記録装置に適用される。

本発明に使用される記録液を静電を利用したインクジェット記録装置に適用する場合は、記録液の比抵抗を105~1011Ω·cmに調整することが好ましく、106~108Ω·cmが特に好ましい。また記録液の粘度は1~30cpに調整することが好ましく、3~20cpが特に好ましい(25°C測定)。

受像材料上にインク吸収層を形成する物質として、有機高分子微粒子、無機顔料、熱硬化性樹脂、有機顔料、有機高分子エマルジョン、水溶性有機高分子、紫外線吸収剤、光安定剤、酸化防止剤、退色防止剤、蛍光染料、塗布助剤などが挙げられ、これらを目的に応じて適宜使用できる。

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色素として、たとえば特開昭63-215252号などに記載されている色素(モノアゾ、ポリアゾ、金属錯塩アゾ、ピラソロンアゾ、アミノピラゾールアゾ、ステルベンアゾ、チアゾールアゾ系の各種アゾ色調、アントロン、アントラキノン誘導体から成るアントラキノン色素、インジゴ、チオインジゴ誘導体から成るインジゴイド色素、フタロシアニン色素、ジフェニルメタン、トリフェニルメタン、キサンテン、アクリジン系のカルボニウム色素、アジン、オキサジン、チアジン系のキノンイミン色素、ポリメチン、アゾメチン系のメチン色素、ベンゾキノン及びナフトキノン色素、ナフタルイミド色素、ペリノン色素など)のうちシアン色調、イエロー色調またはブラック色調のものを使用することができるが、特に好ましいものは以下の通りである。

シアン色素：特開昭64-20278号に記載のフタロシアニン色素および/または特開平1-16679号に記載のインドアニリン色素。

イエロー色素：特開平1-103675号に記

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有機高分子微粒子は、使用する記録液の液媒体に少なくとも一部溶解されるものであり、ビニル樹脂(たとえばポリ塩化ビニル、塩化ビニル-酢酸ビニル共重合物、塩化ビニル-塩化ビニリデン共重合物、ポリ酢酸ビニル、エチレン-酢酸ビニル共重合物)、ステレン樹脂(たとえばポリスチレン、ステレン-アクリル酸エステル共重合物、ステレン、ブタジエン共重合物、ステレン-アクリロニトリル共重合物、ステレン-無水マレイン酸共重合物)、アクリル樹脂(たとえばポリアクリル酸エステル、メチルメタクリレート、ブタジエン共重合物、ポリアクリロニトリル)などが挙げられる。

有機高分子微粒子は中空粒子、カプセル粒子、2種の有機高分子のコアーシエル粒子であつてもよい。有機高分子微粒子の粒径は0.2μ~10μ特に0.4μ~5μが適当である。有機高分子微粒子中に、紫外線吸収剤(好ましい紫外線吸収剤は特開昭60-262159号に記載されているベンゾトリアゾール類である。)、退色防止剤、

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酸化防止剤、蛍光染料などを含有させてもよい。好ましい退色防止剤は上記一般式(Ⅱ)で表わされる化合物である。

無機顔料としてはカオリン、クレー、酸性白土、タルク、炭酸カルシウム、シリカ、合成ケイ酸アルミニウム、合成ケイ酸カルシウム、アルミナホワイト、水酸化アルミニウム、珪藻土、ゼオライト、硫酸バリウム、酸化亜鉛、チタンホワイト、リトポンなどが使用できる。熱硬化性樹脂顔料としては、尿素樹脂微粒子、メラミン樹脂微粒子、ベンゾグアナミン樹脂微粒子などが使用できる。有機高分子エマルジョンとしては、ポリ塩化ビニル、ポリ塩化ビニリデン、塩化ビニル-酢酸ビニル共重合物、ポリ酢酸ビニル、エチレン-酢酸ビニル共重合物、ポリスチレン、ステレン-アクリル酸エステル共重合物、ポリアクリル酸エステル、ステレン-ブタジエン共重合物、メチルメタクリレート-ブタジエン共重合物、ポリアクリロニトリル、ポリエチレン、ポリアミド、ポリエステルなどが使用できる。水溶性有機高分子としては、

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塗布材は、エアーナイフコーティング、プレードコーティング、ロールコーティング、バーコーティング、カーテンコーティングなどを使用することができる。目的に応じて、性能の異なる2種以上の塗布液を多層塗布しても良い。塗布後の乾燥温度は、有機高分子微粒子が粒子形態を保つ範囲で設定することが必要である。塗布乾燥後、マシンカレンダー、クロスカレンダー、スーパーカレンダーなどによつて、インク吸収層表面の平滑化処理を行なつても良い。また、エンボシングロールによつて、インク吸収層表面に凹凸をつけることもできる。

支持体としては、紙、布、プラスチックフィルム、金属フィルム、金属板、木板、ガラス板などが使用できる。紙は木材パルプを主体とするが、合成パルプ、合成繊維、無機繊維を混合しても良い。紙の添加剤として、ロジン、アルキルケテンダイマー、アルケニルコハク酸などのサイズ剤、クレー、タルク、炭酸カルシウムなどの填料、でんぶん、ポリアクリルアミドなどの紙力増強剤、染料、蛍光染料などを目的に応じて使用する。紙

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でんぶん、アルギン酸ソーダ、ゼラチン、カゼイン、メチルセルロース、ヒドロキシエチルセルロース、カルボキシメチルセルロース、ポリビニルアルコール、ポリアクリル酸ソーダ、エチレン-無水マレイン酸共重合物、ステレン-無水マレイン酸共重合物、酢酸ビニル-無水マレイン酸共重合物、ポリアクリルアミド、ポリスチレンスルホン酸ソーダ、ポリビニルベンジルトリメチルアンモニウムクロライド、ポリエチレンイミン、ポリエチレンオキサイド、ポリビニルピロリドンなどが使用できる。

インク吸収層を形成する物質中に少なくとも1種の有機高分子微粒子を含有させるとが好ましい。

インク吸収層の塗布量は、インク吸収層の吸収容量、インク吐出量に応じて、通常1～40g/m<sup>2</sup>、特に5～15g/m<sup>2</sup>が適している。

通常、水または有機溶剤を分散媒として塗布するが、空気を分散媒として静電塗工を行なうことも可能である。

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に、でんぶん、ポリビニルアルコール、ステレン-無水マレイン酸共重合物などのサイズプレス塗布を行なつても良い。

以下に、水性の記録液を用いる方式について記す。

この記録液は水を主として溶媒とし、親水性有機溶剤、親水性色素、およびその他必要に応じ各種添加剤を加えた組成より成つている。

本発明の記録液において、本発明の一般式(Ⅰ)で表わされる色素は記録液100重量部中に通常0.2～1.0重量%含有させるのが適当である。

本発明の記録液には保湿剤を含有させることができる。保湿剤は記録液の耐乾燥性の向上及び染料溶解補助剤の目的で添加するが、それらは常温で殆んど不揮発性であり、1.0～2.0重量%水溶液の常温における表面張力が20 dyne/cm以上特に30 dyne/cm以上であり、その溶液粘度が1.0 cps以下であり、更に前記水溶性染料を常温で0.5重量%以上溶解するものが好ましい。

このような保湿剤は特開昭50-71423号、

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同51-5127号、同51-137505号等に記載されているユーピロリドン類；

特開昭55-71768号等に記載されている1,3-ジアルキル-2-イミダゾリジノン類；

特開昭49-97620号、同51-8031号、同51-8033号に記載されているカルボン酸アミド誘導体；

特開昭55-48267号に記載されているラクトン類；

特開昭51-5129号に記載されているジオキシエチレン硫黄化合物；

特開昭51-52004号に記載されているアルコールアミン類；

特開昭51-31525号に記載されているN-ホルミルラクタム誘導体；

特公昭56-154381号、特開昭56-90865号に記載されているスルホラン及びその誘導体；

特公昭51-40484号、特開昭51-137506号、同54-12909号、同51-1-

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45638号に記載されているポリアルキレングリコール類やポリアルキレングリコールのモノエーテル類；

特公昭56-18628号に記載されている炭酸エステル類；

特開昭55-46979号、同51-129310号に記載されている2-ブチノール、4-ジオール、1-ブチルアルコール、ローブミルアルコール等の一価または二価アルコール；

特開昭55-50072号に記載されているジアルキルスルフォン類；

特開昭56-8471号、同56-88473号、同56-2363号、同56-122876号に記載されている尿素、チオ尿素及びそれらの誘導体；

特開昭55-120678号に記載されているジアルキルホスホネート及びジアルキルホスファイト誘導体；

特公昭52-14643号、特開昭51-9905号に記載されているN-ビニルピロリドンオ

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#### リゴマー：

特開昭56-109264号に記載されているヒダントイン誘導体；

特開昭50-17840号に記載されているヒドロキシプロピルセルローズ等の繊維素誘導体やポリビニルアルコール；

特開昭50-143602号に記載されているポリオキシエチレンソルビタン脂肪酸エステル、ポリオキシエチレン脂肪酸エステル、ポリオキシエチレンアルキルフェニルエーテル等；

特開昭54-62005号に記載されている水溶性アルギン酸塩等が好ましい。

本発明の水性記録液に用いる潤滑剤の含有量はその種類によつて異なるが記録液100重量部に対して0.2~3.0重量%が好ましい。本発明に用いる潤滑剤は2種以上併用することができる。

本発明のマゼンタ記録液の他にイエロー記録液、シアン記録液、及びブラック記録液を用いて減色法でカラー画像をつくる場合、各々の記録液に用いる水溶性色素は「Colour Index」(The

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Society of Dyers and Colourists 及び American Association of Textile Chemists and Colorists 発行)に記載の色素を用いることができる。具体的にはイエロー記録液用水溶性色素としては、例えば特開昭54-89811号、同54-16245号、同49-89534号に記載の色素、更にC.I. Direct Yellow-27、-28、-33、-39、-58、-86、-100、C.I. Acid Yellow-17、-19、-25、-29、-38、-49、-59、-61、-72、-111、-114、-116、C.I. Reactive Yellow-1、-2、-3、-13、-14、-15、-17等の直接染料、酸性染料や反応性染料を使用することができる。

シアン記録液用としての水溶性色素としては、例えば特開昭54-89811号、同52-12008号、同49-89534号に記載の色素、更に、C.I. Direct Blue-1、-8、-71、-76、-78、-80、-86、-90、-1

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06, -108, -123, -163, -165  
やC. I. Acid Blue-29, -126, -17  
1, -175, -183, C. I. Reactive  
Blue-7, -14, -15, -18, -21,  
-25, 等の直接染料、酸性染料や反応性染料を  
使用することができる。

プラック記録液用の黒色色素としては特開昭5  
0-15622号、同50-17840号、同5  
0-49004号、同51-5127号、同51  
-5128号、同51-52004号、同51  
-137506号、同53-61412号、同53  
-77706号、特公昭54-16243号に記載  
の色素、更にC. I. Direct Black-19,  
-38, -71, -74, -75, -112,  
-117, C. I. Acid Black-1, -24,  
-26, -48, -52, -58, -60, -1  
07, -109, -119, -131, -155  
等の色素を用いることができる。

本発明の水性記録液には防黴剤、酸素吸収剤も  
添加することができる。

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アルキルベンゼンスルホン酸ナトリウム等）、カ  
チオン性界面活性剤（例えばアルキルピリジウム  
硫酸塩等）、非イオン性界面活性剤（例えばポリ  
オキシエチレンアルキルエーテル等）あるいは両  
イオン性界面活性剤が使用できる。

本発明のインキが適用される被印字体としては  
紙、布、フィルムベース等が挙げられる。紙とし  
ては、特に制限はなく、一般にインクジェットプ  
リントに用いられている紙を用いることが出来る  
が、特に好ましいのは、紙の上に粘土層やゼラチ  
ン層などを塗布して成る云わゆるコート紙である。  
コート紙に関しては、例えば特開昭55-144  
72号及び同55-146786号の記載を参考  
にすることが出来る。

#### （実施例）

以下に実施例を挙げて本発明を具体的に説明す  
る。なお、部は重量部を表わす。

#### 油性記録液方式

##### 実施例1

市販未コート原紙（坪量64g/m<sup>2</sup>）に、ス

防黴剤としては特開昭52-12008号に記  
載されているデヒドロアセト酸ナトリウム；

特開昭52-12009号に記載されている1,  
2-ベンズイソチアゾリン-3-オノン；

特開昭52-12010号、同52-9610  
5号に記載されている6-アセトキシ-2,4-  
ジメチル-3-メジオキサン；

特開昭50-15622号に記載されているホ  
ルマリン及びペンタクロロフェノールナトリウム；

特開昭51-30019号に記載されている安  
息香酸ナトリウム；

特開昭53-135707号に記載されている  
8-キノリノールのクエン酸塩等が有効である。

酸素吸収剤としては特開昭52-74406号、  
同53-61412号に記載されている亜硫酸ナ  
トリウム、亜硫酸水素ナトリウム等の亜硫酸塩、  
同56-24472に記載されているD-グルコ  
ース、L-アスコルビン酸等が使用できる。

さらに表面張力調整剤としてアニオン性界面活  
性剤（例えばアルキル硫酸エステルナトリウム、

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テレンーアクリル酸エステル共重合物の中空微粒  
子（粒子径0.3~0.4μ）43部（固型分重  
量比、以下同じ）気相法無水シリカ（粒子径1.2  
mμ）17部、ステレン-ブタジエン共重合物ラ  
テックス12部、ポリ酢酸ビニルラテックス18  
部、ポリメチルメタクリレート微粒子（粒子径約  
8μ）10部よりなる塗布液を、固型分量が10  
g/m<sup>2</sup>となるようにワイヤーバーを使用して塗  
布しインクジェット記録用紙-1を調製した。

この記録用紙に、下記成分より作られたインク  
液を、ノズル孔径50μのヘッドを設置した静電  
加速型インクジェット装置を用いて、ドット本数  
8本/mmにてインクジェット記録を行なつた。

#### 〔インク液A〕

本発明の色素(4)	6重量部
フタル酸ジエチル	30重量部
アジピン酸ジイソプロピル	44重量部
N,N-ジエチルドデカンアミド	20重量部
このインク液の比抵抗は3.6×10 <sup>7</sup> Ω·cm (25°C)、粘度は7.1cp(25°C)であ	

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つた。このインク液の吐出性は良好であり、鮮明で濃度の高いマゼンタ画像が得られた。

このインクで印写した紙を水中に10分間浸しても画像のニジミや流れは認められなかつた。

#### 実施例2

下記の組成からなるインク液B～Eを調製した。

##### [インク液B]

本発明の色素(11)	6重量部
本発明の化合物(A-3)	4重量部
アジピン酸ジブチル	7.0重量部
ベンジルアルコール	2.0重量部

##### [インク液C]

本発明の色素(13)	6重量部
本発明の化合物(A-7)	6重量部
マレイン酸ジブチル	6.1重量部
フタル酸ジエチル	2.2重量部
N-メチルピロリドン	5重量部

##### [インク液D]

本発明の色素(20)	6重量部
本発明の化合物(A-18)	3重量部

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用して塗布し、インクジェット記録用紙-2を調製した。

この記録用紙に、下記成分より作られたインク液を用いて実施例1と同様にインクジェット記録を行なつた。

##### [インク液E]

本発明の色素(30)	6重量部
マレイン酸ジブチル	5.4重量部
フタル酸ジエチル	2.5重量部
ベンジルアルコール	1.5重量部

このインク液の比抵抗は $3.2 \times 10^7 \Omega \cdot \text{cm}$  ( $25^\circ\text{C}$ )、粘度は $7.4 \text{ cp}$  ( $25^\circ\text{C}$ )であつた。

このインク液の吐出性は良好であり、鮮明で濃度の高いマゼンタ画像が得られた。この画像を3ヶ月放置しておいた後の濃度低下率は1%以下であつた。

#### 実施例4

主として酸化ケイ素微粒子とポリビニルアルコールからなり、重量比で7.5:2.5の割合で含有

アジピン酸ジエチル	4.1重量部
フタル酸ジエチル	3.0重量部
ジプロピレングリコールモノ	
メチルエーテル	2.0重量部

これらの各インク液を実施例1と同様にインクジェット記録用紙に印写した。インク液B～Dともに良好な吐出性を示し、それぞれ鮮明なマゼンタ画像が得られた。これらの画像を室内光に3ヶ月放置しておいた後の濃度低下率は1%以下であつた。これらのインクで印写した紙を水中に10分間浸しても画像のニジミや流れは認められなかつた。

#### 実施例5

実施例1と同じ原紙に、ポリステレン微粒子(ダウケミカル製 PLASTIC PIGMENT 722)5.0部(固型分重量比、以下同じ)湿式法シリカ(平均粒径 $2.7 \mu$ )1.5部、ポリメチルメタクリレート微粒子(粒径 $8 \mu$ )1.0部、ポリ酢酸ビニルラテックス2.5部よりなる塗布液を、固型分量が $10 \text{ g/m}^2$ となるようにワイヤーバーを使

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している塗布層を設けたインクジェット記録用紙に実施例1と同様にして印写した。但し、インク液は下記組成のものを用いた。

##### [インク液F]

本発明の色素(31)	6重量部
フタル酸ジエチル	3.0重量部
アジピン酸イソプロピル	4.4重量部
N,N-ジエチルドデカンアミド	2.0重量部

このインク液の比抵抗は $3.7 \times 10^7 \Omega \cdot \text{cm}$  ( $25^\circ\text{C}$ )、粘度は $7.2 \text{ cp}$  ( $25^\circ\text{C}$ )であつた。このインク液の吐出性は良好であり、鮮明で濃度の高いマゼンタ画像が得られた。この画像を室内光に3ヶ月放置しておいた後の濃度低下率は3%以下であつた。

#### 実施例6

下記の組成よりなるインク液G～Iを調製した。

##### [インク液G]

油溶性のシアン色素	5重量部
(下記に示す)	
フタル酸ジエチル	3.0重量部

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アジピン酸ジイソプロピル 4.5 重量部  
 N,N-ジエチルドデカンアミド 2.0 重量部  
 [インク液 H]

油溶性イエロー色素 5 重量部  
 (下記に示す)  
 フタル酸ジエチル 2.8 重量部  
 アジピン酸ジイソプロピル 4.5 重量部  
 N,N-ジエチルドデカンアミド 2.2 重量部  
 [インク液 I]

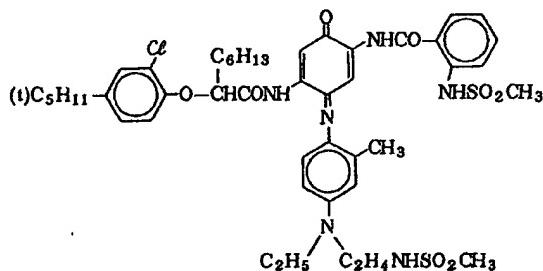
油溶性ブラック色素 6 重量部  
 (下記に示す)  
 フタル酸ジエチル 3.2 重量部  
 アジピン酸ジイソプロピル 4.5 重量部  
 N,N-ジエチルドデカンアミド 1.7 重量部

これらの各インク液を実施例1のインク液と共に、実施例1で用いたと同じ静電加速型インクジェット装置に設置し、インクジェット記録紙に印写した。インク液(G)、(H)および実施例1のインク液を単独で印写した部分は、それぞれ鮮やかなシアン、イエローおよびマゼンタ画像を形

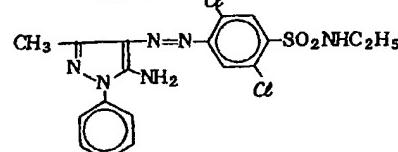
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成し、また2種のインクが同等に重なつた部分は、鮮やかな緑、赤および青の画像を形成した。またこれらの中間色の色再現も満足すべきものであつた。インク液(I)を単独で印写した部分は濃度の高いブラック画像を形成し、このインク液と上記のインク液が重なつた部分は「黒のしまり」が良好なカラー画像を形成した。

〔油溶性シアン色素〕

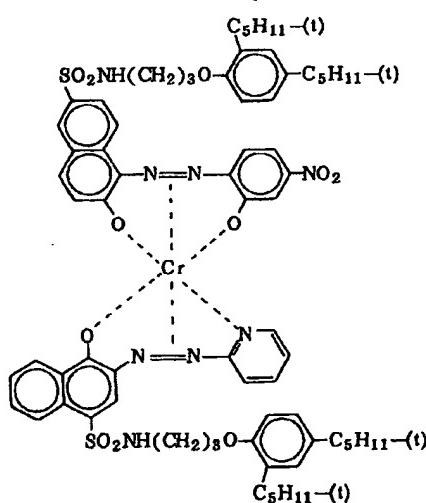


〔油溶性イエロー色素〕



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〔油溶性ブラック色素〕

水性記録液方式

## 実施例6

L B K P (広葉樹さらしクラフトパルプ) 1.0  
 部を沪水度 C S F 43.0 cc に呑解し、タルク  
 5 部、ケン化ロジン 1 部、硫酸バントム部を添加  
 して坪量 100 g / m<sup>2</sup> の原紙を長綱抄紙機で抄

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紙した。抄紙時にサイズプレスで酸化でんぶんを固型分で 2 g / m<sup>2</sup> 塗布した。

合成ゼオライト 7.0 部、合成ケイ酸アルミニウム 3.0 部、ヘキサメタリン酸ソーダ 0.3 部、カゼイン 1.0 部、ステレン-ブタジエン共重合物ラテックス 1.0 部、メラミン樹脂 1 部及びポリエチレングリコール 2 部よりなる固型分 3.0 % の塗布液を調製した。

前述の原紙に、塗布液を固型分で片面 1.0 g / m<sup>2</sup> になるようエアーナイフコーナーで塗布、乾燥し、次に、スーパーカレンダーを通して記録紙を作成した。

この記録用紙に、下記成分より作られたインク液を、ノズル孔径 5.0 μ のヘッドを設置したオンドマンド型インクジェット装置を用いて、ドット本数 8 本 / mm<sup>2</sup> にてインクジェット記録を行つた。

〔インク液 J〕

本発明の色素 (54)	1.8 部
N-メチル-2-ビロリドン	15.0 部
ジエチレングリコール	2.0 部

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トリエタノールアミン	2.0部
水	79.2部

以上の配合物を30~40°Cに加熱しながら、時間攪拌した後、平均孔径0.8μm、直径4.7mmのミクロフィルターFMタイプ(富士写真フィルム製)を用いて加圧戻過(3kg/cm<sup>2</sup>)し、目的とするインキを得た。

同様にして下記配合物を用いて本発明のインク液K~Nを得た。

## 〔インク液K〕

本発明の色素(56)	1.8部
チオジグリコール	15.0部
ジエチレングリコールモノエチルエーテル	2.0部
トリエタノールアミン	2.2部
水	79.0部

## 〔インク液L〕

本発明の色素(58)	2.0部
1,3-ジメトキシメチル-2-イミダゾリジノン	15.0部

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チオジグリコール	5.0部
ジエチレングリコール	2.0部
トリエタノールアミン	1.0部
水	75.0部

## 〔インク液M〕

本発明の色素(59)	2.0部
N-メチル-2-ピロリドン	10.0部
スルホラン	5.0部
トリエタノールアミン	1.0部
水	82.0部

## 〔インク液N〕

本発明の色素(55)	2.0部
N-メチル-2-ピロリドン	10.0部
N-ヒドロキシエチラクタミド	5.0部
ノニオン界面活性剤	0.1部
(n-C <sub>8</sub> H <sub>17</sub> -O-CH <sub>2</sub> CH <sub>2</sub> O) <sub>z</sub> -H zは約10)	
トリエタノールアミン	1.0部

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## 手 続 補 正 書

平成2年4月2日(通)

特許庁長官 殿

特許出願人 富士写真フィルム株式会社

1. 事件の表示 平成2年特願第26406号

2. 発明の名称 インクジェット記録方法

3. 補正をする者

事件との関係 特許出願人

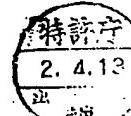
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4. 指正の対象 明細書の「特許請求の範囲」の欄、「発明の詳細な説明」の欄

## 5. 指正の内容

明細書の「特許請求の範囲」の項の記載を別紙-1の通り指正する。

明細書の「発明の詳細な説明」の項の記載を下記の通り指正する。

## 1) 第8頁2行目の

「アリール基、」の後に  
「ヘテロ環基、」

を挿入する。

## 2) 第9頁10行目の

「スルホ基」の後に  
「、4級アンモニウム基またはカルボキシル基」

を挿入する。

## 3) 第9頁15行目の

「スルホ基を1個」を  
「1個のスルホ基、4級アンモニウム基

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またはカルボキシル基を」

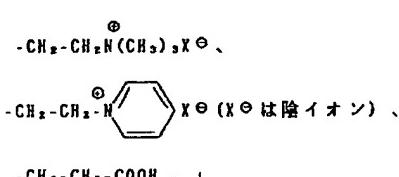
と指正する。

4) 第10頁3行目の「式中R<sup>1</sup>は」の後に  
「水素原子または」

を挿入する。

5) 第13頁6行目の  
「R<sup>1</sup>はアルキル基」を  
「R<sup>1</sup>は水素原子またはアルキル基」

と指正する。

6) 第16頁8行目の  
「-CH<sub>2</sub>-CH<sub>2</sub>-NH(CH<sub>3</sub>)<sub>2</sub>-SO<sub>3</sub>H、」を  
「-CH<sub>2</sub>-CH<sub>2</sub>-NH(CH<sub>3</sub>)<sub>2</sub>-SO<sub>3</sub>H、


と指正する。

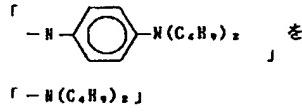
7) 第20頁下から2行目の  
「エニル基等」の後に

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「ヘテロ環基（ビリジニル基、フラニル基等）」

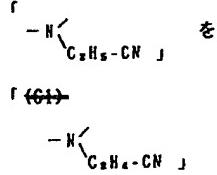
を挿入する。

## 8) 第22頁4行目の化合物(2)の構造式中の



と指正する。

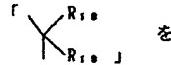
## 9) 第37頁の化合物(61)の構造式中の



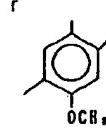
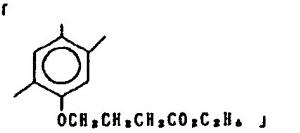
と指正する。

10) 第39頁6行目の化合物(68)の構造式の  
後に別紙-2を挿入する。

11) 第48頁2行目的一般式(I-5)の構  
造式中の



と指正する。

12) 第52頁2行目の化合物の(A-9)の  
構造式中の

と指正する。

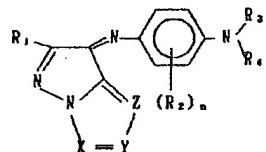
13) 第56頁8行目の化合物(A-35)の  
構造式の後に別紙-3を挿入する。

## 別紙-1

## 特許請求の範囲

(1) 記録液を液滴状に噴射して受像材料上に画像を記録するインクジェット記録方法において、下記記録液が一般式(I)で表わされる色素を含むことを特徴とするインクジェット記録方法。

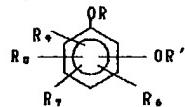
## 一般式(I)



式中、R<sub>1</sub>、R<sub>2</sub>は水素原子、ハロゲン原子、アルキル基、シクロアルキル基、アルコキシ基、アリール基、アリールオキシ基、アラルキル基、シアノ基、アシルアミノ基、スルホニルアミノ基、ウレイド基、アルキルチオ基、アリールチオ基、アルコキシカルボニル基、カルバモイル基、スルファモイル基、スルホニル基、アシル基、アミノ基を表わし、R<sub>3</sub>、R<sub>4</sub>は水素原子、アルキル基、シクロアルキル基、アラルキル基、アリール基を表す。

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## 一般式(II)



式中、RおよびR'は水素原子、アルキル基、アシル基、又はスルホニル基を表わし、R<sub>1</sub>、R<sub>2</sub>およびR<sub>3</sub>はそれぞれ、水素原子、アルキル基、アリール基、アルコキシ基、アルキルチオ基、アシルアミノ基、水酸基またはハロゲン原子を表わす。ORとOR'のうち少なくとも一つは、これらのオルト位にあるR<sub>1</sub>～R<sub>4</sub>のいずれかと互いに結合して、5員もしくは6員環を形成してもよく、またR<sub>1</sub>～R<sub>4</sub>のうち互いにオルト位の関係にある少なくとも一組が互いに結合して5員もしくは6員環を形成してもよい。

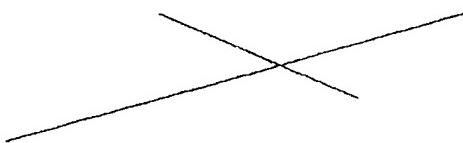
(3) 一般式(I)で表わされる色素がスルホ基、4級アンモニウム基またはカルボキシル基を有さず、記録液の溶媒が主として有機溶剤であることを特徴とする請求項(I)記載のインクジェット記録方法。

表わす。R<sub>1</sub>とR<sub>2</sub>は互いに結合して環を形成してもよく、また、R<sub>2</sub>とR<sub>3</sub>あるいはR<sub>3</sub>とR<sub>4</sub>が結合して環を形成してもよい。nは0～3の整数を表わす。X、YおよびZは

$\begin{array}{c} R_5 \\ | \\ -C- \end{array}$ または窒素原子を表わす(R<sub>5</sub>は水素原子、アルキル基、シクロアルキル基、アラルキル基、アリール基、ヘテロ環基、アルコキシ基、アリールオキシ基、アミノ基を表わす)。

$\begin{array}{c} R_5 \\ | \\ X-C- \end{array}$ またはXとYが-C-の時あるいはYとZが-C-の時、互いに結合して飽和ないし不饱和炭素環を形成してもよい。

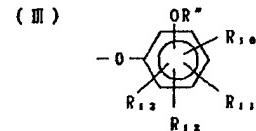
(2) 画像中に下記一般式(II)で表わされる化合物を共存させることを特徴とする請求項(I)記載のインクジェット記録方法。



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(4) 一般式(I)で表わされる色素が少なくとも1個のスルホ基、4級アンモニウム基またはカルボキシル基を有し、記録液の溶媒が主として水であることを特徴とする請求項(I)記載のインクジェット記録方法。

(5) 一般式(I)で表わされる色素が下記一般式(III)で表わされる基を有することを特徴とする請求項(I)記載のインクジェット記録方法。



式中R''は水素原子またはアルキル基を表わし、R<sub>1</sub>、R<sub>2</sub>、R<sub>3</sub>およびR<sub>4</sub>はそれぞれ、水素原子、アルキル基、アリール基、アルコキシ基、アルキルチオ基、アシルアミノ基、水酸基またはハロゲン原子を表わす。OR''とオルト位にあるR<sub>1</sub>～R<sub>4</sub>のいずれかと互いに結合して5員もしくは6員環を形成してもよく、またR<sub>1</sub>～R<sub>4</sub>のうち互いにオルト位の関係にある少なくとも一組が結合して5員もしくは6員環を形成してもよい。